

REPLACEMENT TRANSFORMER ENCYCLOPEDIA

for
Service
Engineers

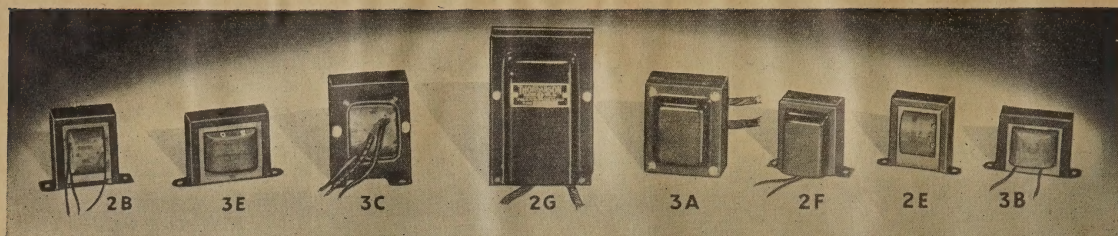


THORDARSON ELECTRIC MFG. CO.

500 W. HURON ST., CHICAGO, ILL.

Transformer Specialists Since 1895

No.
352
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MODERN conditions call for fast and accurate service. Your time and your customer's convenience and good will are valuable. The successful radio service engineer keeps a small stock of replacement transformers on hand to meet his requirements without delay. Thordarson does its part by having a complete line of replacement types for practically all receivers. The most popular types are listed below with full electrical and physical characteristics for your convenience. These transformers are rec-

ommended in the pages of this encyclopedia which has been compiled by Thordarson engineers to assist you in the proper selection of Power Transformers, Filter Chokes, Audio and Output Transformers. Types are listed below in numerical order for easy reference.

The Encyclopedia is larger than ever before and the receiver types have been carefully arranged to enable you to quickly find your model. KEEP THIS BOOK IN A HANDY REFERENCE SPOT — you will find it invaluable.

AUDIO TRANSFORMERS

For coupling the plate or plates of an amplifier stage to the grid or grids of the next stage where grid current is not drawn.

Type No.	Classification	Turns Ratio	Ohms Impedance		Pri. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Pri.	Sec.			Width	Depth	W.	D.	H.	
T-13A34	RECEIVER (midget)	3:1	10,000	90,000	8	3B	2 $\frac{3}{8}$		2 $\frac{13}{16}$	1 $\frac{5}{8}$	1 $\frac{5}{8}$	$\frac{3}{4}$
T-13A35	RECEIVER (midget)	3:1	10,000	90,000	8	3B	2 $\frac{3}{8}$		2 $\frac{13}{16}$	1 $\frac{5}{8}$	1 $\frac{5}{8}$	$\frac{3}{4}$
T-13A36	RECEIVER (midget)	1:1	20,000	20,000	8†	3B	2 $\frac{13}{16}$		3	1 $\frac{3}{4}$	2	1
T-29A99	RECEIVER	3:1	10,000	90,000	8	2B	2 $\frac{3}{8}$		2 $\frac{7}{8}$	2	2 $\frac{3}{8}$	1 $\frac{1}{4}$
T-33A91	RECEIVER	3:1	10,000	90,000	8	2B	2 $\frac{3}{8}$		2 $\frac{7}{8}$	2	2 $\frac{3}{8}$	1 $\frac{1}{4}$
T-57A38	AMPLIFIER	3:1	10,000	90,000	8	2F	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-57A41	AMPLIFIER	3:1	10,000	90,000	8	2F	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-57A42	RECEIVER (large)	3:1	10,000	90,000	8	2B	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2
For coupling screen grid or power detector (Clarion AC-60).												
T-58A70	AMPLIFIER Has split Secondary.	1.5:1	20,000	45,000	10†	2F	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-67A91	AMPLIFIER	1.5:1	20,000	45,000	10†	2B	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2
T-74A31	AMPLIFIER	1:1	10,000	10,000	8	2F	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$

DRIVER TRANSFORMERS

For coupling the plate or plates to the grids of an amplifier stage in which grid current is drawn during a part of the audio cycle.

Type No.	Driver Tubes	Output Tubes	Class	Ratio Pri. to ½ Sec.	Pri. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.	
T-17D01	1-6F6 Triode 1-42 Triode, 1-2A5 Triode	2-6F6, 6L6, etc.	AB	1.7:1 1.5:1, 1.3:1	31	3B	2 $\frac{7}{8}$		3 $\frac{1}{16}$	2	2	1 $\frac{1}{2}$
T-67D47	1-6N7, 6A6, 53	1-6N7, 6A6, 53	B	5.25:1	10	2F	2 $\frac{3}{8}$		2 $\frac{3}{4}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$
T-67D50	1-89 Triode	1-79	B	2:1	32	2F	2 $\frac{3}{8}$		2 $\frac{3}{4}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$
T-67D78	1-46, 59, 6F6, 42, 2A5 Triode	2-46, 59 2-6L6	B AB2	2.2:1	32	2F	2 $\frac{15}{16}$		3 $\frac{1}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-74D32	2-6C5, 76, 56	2-6F6, 42, 2A5 4-2A3, 6B4G	AB2 AB	3:1	10	2F	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-78D46	1-30	1-1J6G, 19 2-30	B B	2.4:1	7	2B	2 $\frac{1}{8}$		2 $\frac{9}{16}$	1 $\frac{5}{8}$	2	$\frac{3}{4}$
T-81D42	1-6F6 Triode 1-42 Triode 1-2A5 Triode	2-6F6 Triode 2-42 or 2-2A5 Pentode	AB2 AB2 AB2	1.7:1 1.5:1 1.3:1	31	2F	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-81D52	1-6C5, 76 1-56	2-6F6 Triode 2-42, 2A5 Triode	AB AB	1.82:1 1.67:1	8	2F	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$

OUTPUT TRANSFORMERS

Type No.	Tube Type	Class	Ohms Impedance		Pri. M.A. Per Side	Max. Watts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Pri.	Sec.				Width	Depth	W.	D.	H.	
T-13S37	1-6F6, 42, 2A5, 47	A	7,000	1/2/4	36	5	3E	2		2 $\frac{3}{8}$	1 $\frac{5}{8}$	1 $\frac{5}{8}$	$\frac{1}{2}$
T-13S38	Universal Single or P-P Tubes	A	4,000/7,000 8,000/10,000 14,000 Ct.	Adjustable .1 to 29	36	8	3E	2 $\frac{3}{8}$		2 $\frac{1}{16}$	1 $\frac{5}{8}$	1 $\frac{5}{8}$	$\frac{3}{4}$
T-13S40	2-6F6, 42 P-P 2-2A5, 47 P-P	A, A14,000 Ct.		1/2/4	40	10	3E	2 $\frac{3}{8}$		2 $\frac{13}{16}$	1 $\frac{5}{8}$	1 $\frac{5}{8}$	$\frac{3}{4}$
T-13S41	Universal P-P Tubes	A	3,000/5,000 6,600/7,000 8,000/10,000	Adjustable .1 to 29	60	20	2E	2 $\frac{15}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{8}$	3	2 $\frac{1}{4}$

OUTPUT TRANSFORMERS (Continued)

Type No.	Tube Type	Class	Ohms Impedance		Pri. M.A. Per Side	Max. Watts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Pri.	Sec.				Width	Depth	W.	D.	H.	
T-13S42	Universal Single Tube	A	1,500/2,000 4,000/5,000 7,000	Adjustable .1 to 29	55	10	3E	2 $\frac{3}{8}$		2 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{4}$
T-13S43	1-1F4, 1D4, 1F5G	A	16 000	1/2/4	10	5	3E	2		2 $\frac{3}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{8}$	$\frac{1}{2}$
T-14S81	1-42, 2A5, 6F6 or P-P 45, 71	A	7,000 Ct.	3 to 6	40	5	3B	2		2 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{1}{2}$
T-14S82	1-25L6	A	1,500	3 to 6	55	5	3B	2		2 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{1}{2}$
T-14S83	1A5-G, 1E7-G	A	25,000 Ct.	3 to 6	8	5	3B	2		2 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{1}{2}$
T-14S84	1-1C5G, 1Q5G	A	8,000	3 to 6	10	5	3B	2		2 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{1}{2}$
T-14S85	Universal Single or P-P Tubes	A	4,000/7,000 8,000/10,000 14,000 Ct.	Adjustable .1 to 29	36	8	3B	2 $\frac{3}{8}$		2 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{4}$
T-17S10	1-6LG	A	2,500	2/4/8/500	80	8	2F	2 $\frac{1}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-17S12	2-6L6 P-P (with 300V on plate and screen)	AB1	4,300*	4/8/15/250/500	95	25	2F	3 $\frac{1}{16}$		3 $\frac{1}{16}$	3 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
T-17S13	2-6L6 P-P	AB1	6,600*	4/8/15/250/500	80	34	2G	2 $\frac{1}{16}$	2 $\frac{1}{16}$	3 $\frac{1}{8}$	3 $\frac{3}{8}$	4 $\frac{1}{8}$	5 $\frac{1}{2}$
T-17S14	2-6L6 P-P	AB2	5,500*	4/8/15/250/500	90	40	2G	2 $\frac{1}{16}$	2 $\frac{1}{16}$	3 $\frac{1}{8}$	3 $\frac{3}{8}$	4 $\frac{1}{8}$	5 $\frac{1}{4}$
T-17S15	4-6L6 P-P Par.	AB1	3,300*	4/8/15/250/500	155	60	2G	2 $\frac{1}{16}$	2 $\frac{1}{16}$	3 $\frac{1}{8}$	3 $\frac{5}{8}$	4 $\frac{1}{8}$	5 $\frac{3}{4}$
T-17S16	4-6L6 P-P Par.	AB2	1,900*	84/100/125/166/ 250/500	230	120	2G	3	4 $\frac{1}{4}$	3 $\frac{3}{4}$	5	4 $\frac{1}{16}$	14 $\frac{1}{4}$
T-57S01*	Universal Single or	A	4,000/7,000	Adjustable	36	8	2E	2 $\frac{3}{8}$		2 $\frac{1}{8}$	2	2 $\frac{3}{8}$	1 $\frac{1}{4}$
T-57S02†	P-P Tubes	A	8,000/10,000 14,000 Ct.	.1 to 29			2B	2 $\frac{3}{8}$		2 $\frac{1}{8}$	2	2 $\frac{3}{8}$	1 $\frac{1}{4}$
T-58S72	2-2A3, 6B4G P-P 2-48, 25L6 P-P	AB A	3,000	4/8/15/500	60	30	2F	3 $\frac{1}{16}$		3 $\frac{1}{16}$	3 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{1}{4}$
T-65S94	2-50 P-P 2-6F6, 42, 2A5 P-P	A AB2	8,000	4/8/15/500	55	40	2F	3 $\frac{1}{16}$		3 $\frac{1}{16}$	3 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
T-67S48	2-45, 71, 43, 25A6 P-P 1-6N7, 6A6, 53 P-P	A B	8,000	4/8/15/500	36	25	2F	2 $\frac{1}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-67S51	2-6F6, 42, 2A5, 47 P-P	A	14,000	4/8/15/500	40	20	2F	2 $\frac{1}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-67S52	2-46, 59 P-P 2-6F6, 42, 2A5 P-P 2-6N7, 6A6, 53 P-P Par.	B AB2 B	5,800	4/8/15/500	60	30	2F	3 $\frac{1}{16}$		3 $\frac{1}{16}$	3 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
T-67S54	2-6L6 P-P 2-2A3, 6B4G, 45 P-P	A AB	5,000	4/8/15/500	60	30	2F	3 $\frac{1}{16}$		3 $\frac{1}{16}$	3 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
T-67S92	4-2A3, 6B4G, 45 P-P Par. 4-48, 25L6, P-P Par.	AB A	1,500	4/8/15/500	80	40	2F	3 $\frac{1}{16}$		3 $\frac{1}{16}$	3 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
T-75S75	2-6F6, 42 or 2A5 1-6N7, 6A6, 53 P-P 2-6N6G, 6B5, 2B6, 6AC5 P-P	AB2 B B	10,000	4/8/15/500	45	40	2F	3 $\frac{1}{16}$		3 $\frac{1}{16}$	3 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
T-81S01	1-19, 1J6G, 1G6G P-P 2-30, 49 P-P	A B	10,000 Ct.	2/4/8	15	8	2B	2 $\frac{1}{8}$		2 $\frac{1}{16}$	1 $\frac{1}{8}$	2	$\frac{3}{4}$

*10% Feedback Winding

CHOKES

Type No.	Inductance		Current Rating M.A.	D.C. Res. Ohms	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
	At Zero D.C.	At Rated D.C.					Width	Depth	W.	D.	H.	
T-13C26	21	8	40	530	1600	3B	2		2 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{1}{2}$
T-13C27	22	10	40	475	1600	3B	2 $\frac{3}{8}$		2 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{4}$
T-13C28	20	10	65	460	1600	3B	2 $\frac{1}{16}$		3	1 $\frac{3}{4}$	2	1
T-13C29	20	9	85	250	1600	3B	2 $\frac{3}{4}$		3 $\frac{1}{8}$	2	2	1 $\frac{1}{2}$
T-13C30	25	8	150	200	1600	2B	2 $\frac{1}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-14C61	14	7	55	200	1600	3B	2 $\frac{3}{8}$		2 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{4}$
T-14C62	16	8	55	250	1600	3B	2 $\frac{3}{8}$		2 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{4}$
T-14C63	19	8	55	300	1600	3B	2 $\frac{3}{8}$		2 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{4}$
T-18C92	37.8	18	35	405	1100	3B	2 $\frac{1}{8}$		3 $\frac{1}{8}$	2	2	1 $\frac{1}{2}$
T-29C27	800	500	.5	6150	1600	2B	2 $\frac{3}{8}$		2 $\frac{1}{8}$	1 $\frac{3}{4}$	2 $\frac{3}{8}$	1
T-44C02	31	12	80	405	1600	3B	2 $\frac{1}{8}$		3 $\frac{1}{8}$	2	2	1 $\frac{1}{4}$
T-47C07	20	12	75	410	1600	3B	3 $\frac{1}{8}$		3 $\frac{5}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{4}$	1 $\frac{1}{4}$
T-52C98			.5	6150	1600	2F	2 $\frac{3}{8}$		2 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{4}$
T-57C54	27	10	110	200	1600	2F	2 $\frac{1}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-67C49	12	5	200	80	1600	2F	3 $\frac{1}{16}$		3 $\frac{1}{16}$	3 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{3}{4}$
T-68C08			35	405	1600	2F	2 $\frac{3}{8}$		2 $\frac{3}{4}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$
T-74C29	29	15	150	200	2000	2G	2 $\frac{1}{16}$	2 $\frac{1}{16}$	3 $\frac{3}{8}$	3 $\frac{3}{8}$	4 $\frac{1}{8}$	5 $\frac{1}{4}$
T-74C30			15	2100		3B	2 $\frac{1}{16}$		2	1 $\frac{1}{2}$	2 $\frac{3}{8}$	1
T-75C49	22	8	120	290	1600	3B	2 $\frac{3}{4}$		3 $\frac{1}{8}$	2	2	1 $\frac{1}{2}$
T-75C51	24	13	250	121	1600	2G	3	2 $\frac{1}{16}$	3 $\frac{3}{4}$	3 $\frac{1}{16}$	4 $\frac{1}{16}$	8

POWER TRANSFORMERS LISTED ON PAGE 29.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
AIRLINE (See Montgomery Ward)						
ALL AMERICAN MOHAWK CORP. (See also Wurlitzer)						
D, K.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
J.....	T-13R02	☆	☆	☆	☆	T-57S01
C-6, Studio.....	T-13R06	T-13C30	☆	☆	☆	§Special
S-6.....	T-13R03	☆	☆	☆	☆	T-57S01
S-7, S-8*, SW-8....	T-13R04	☆	☆	☆	*T-33A91	T-57S01
S-10.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
S-40.....	T-13R01	☆	☆	☆	☆	T-57S01
S-50, S-63, SA-65, SW-80.....	T-13R03	☆	☆	☆	☆	T-57S01
60, 61, 62, 65, 66....	T-56R01	T-13C29	T-13C29	T-29A99	T-33A91	§Special
80, 83, 84, 85, 86, 88	T-56R01	T-13C29	T-13C29	T-29A99	T-33A91	§Special
S-80.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
90.....	T-13R06	T-13C30	☆	T-33A91	T-13A36	T-57S01
SA-90, SA-91.....	T-13R06	☆	☆	☆	☆	T-57S01
96.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
SA-110.....	T-13R06	T-13C30	☆	☆	T-67D78	T-13S41
SA-130.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
226, 227.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	T-57S01
ANDREA						
1C5, 2C5, 510, 511, C5L, C5S.....	T-13R12	☆	☆	☆	☆	T-57S01
1D7, 2D7, 3D7, 4D7, 5D7, 6D7, 7D7, 8D7, ch. D7L, D7S.....	T-13R13	☆	☆	☆	☆	T-57S01
1D8, 2D8, 3D8, 4D8, 5D8, 6D8, 7D8, 8D8, D8L, D8S.....	T-13R12	☆	☆	☆	☆	T-13S41
1D10, 2D10, 3D10, 4D10, 5D10, 6D10, 7D10, 8D10, 9D10, 10D10, D10L, D10S.....	T-13R14	T-75C49	☆	☆	☆	T-57S01
1E6, 2E6, PE6L, PE6S, PE66L, PE66S, 11E6, 12E6, 14E6.....	T-13R12	☆	☆	☆	☆	T-13S41
1E8, 2E8, 3E8, 4E8, 5E8, 6E8, 7E8, 8E8, 9E8, 10E8, PE8L, PE8S.....	T-13R12	☆	☆	☆	☆	T-13S41
2A5, 5A5, 6A5, ch. A5L, A5S.....	T-13R12	☆	☆	☆	☆	T-57S01
2B6, 3B6, 4B6, ch. B6L, B6S.....	T-13R13	☆	☆	☆	☆	T-57S01
2B8, B8L, B8S.....	T-13R12	☆	☆	☆	☆	T-57S01
2D5, 3D5, 4D5, 6D5, 8D5, D5L, D5S, PD5.....	T-13R19	☆	☆	☆	☆	T-57S01
3A7, ch. A7L.....	T-13R12	☆	☆	☆	☆	T-57S01
3E11, 4E11, 5E11, 6E11, 7E11, 8E11, 9E11, 10E11, PE11L, PE11S.....	T-13R14	T-75C49	☆	☆	☆	T-57S01
B4, B4L, 400, 401....	T-13R19	☆	☆	☆	☆	T-57S01
C6B.....	T-14R39	T-14C63	☆	☆	☆	T-57S01
E6B, 626, 627, 628....	T-14R35	T-14C63	☆	☆	☆	T-14S82
APEX (See U. S. Radio and Television)						
ATWATER KENT MFG. CO.						
43.....	T-56R01	T-13C28	☆	T-29A99	T-33A91	T-57S01
55, 55C Early.....	T-13R05	T-13C29	T-13C29	☆	T-33A91	T-57S01
55 Late, 60, 60C, 70, 74, 76, L-1, L-2, F, P.....	T-13R04	T-13C29	T-13C27	☆	T-33A91	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
ATWATER KENT MFG. CO. (Contd.)						
72, H-1.....	T-13R06	T-13C30	T-13C29	☆	T-33A91	T-57S01
80.....	T-13R03	☆	☆	☆	☆	T-57S01
82.....	T-13R04	☆	☆	☆	☆	T-57S01
83, 84.....	T-13R03	☆	☆	☆	☆	T-57S01
85, 86, 87.....	T-13R04	☆	☆	☆	☆	T-57S01
89, 89P.....	T-56R05	T-13C30	T-13C27	☆	§Special	T-57S01
90, 92, 94.....	T-13R04	☆	☆	☆	☆	T-57S01
96.....	T-13R04	T-13C30	§Special	☆	☆	T-57S01
99, 99P.....	T-56R05	T-13C30	T-13C27	☆	§Special	T-57S01
145, 165.....	T-13R02	☆	☆	☆	☆	T-57S01
168.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
184, 184X.....	T-13R12	☆	☆	☆	☆	T-57S01
185, 185A, 186....	T-13R02	☆	☆	☆	☆	T-57S01
188, 228.....	T-13R04	☆	☆	☆	☆	T-57S01
206, 217, 236, 246, 266, 286, 356, 376....	T-13R03	☆	☆	☆	☆	T-57S01
208.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
P216, P236.....	T-13R12	☆	☆	☆	☆	T-57S01
E248.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
255.....	T-13R12	☆	☆	☆	☆	T-57S01
310.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
312.....	T-13R09	T-74C29	☆	T-33A91	T-13A36	T-13S41
317.....	T-13R12	☆	☆	☆	☆	T-57S01
325.....	T-13R02	☆	☆	☆	☆	T-57S01
328, 337.....	T-13R12	☆	☆	☆	☆	T-57S01
E412, E412X, P412, P412X.....	T-13R09	T-74C29	☆	T-33A91	T-13A36	T-13S41
427.....	T-13R03	☆	☆	☆	☆	T-57S01
435 lat and 2nd....	T-13R12	☆	☆	☆	☆	T-57S01
447.....	T-13R03	☆	☆	☆	☆	T-57S01
448.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
475.....	T-13R02	☆	☆	☆	☆	T-57S01
480.....	T-13R07	T-13C29	☆	☆	T-33A91	T-57S01
487.....	T-13R03	☆	☆	☆	☆	T-57S01
509.....	T-13R04	☆	☆	☆	☆	T-57S01
510.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
525.....	T-13R02	☆	☆	☆	☆	T-57S01
545.....	T-13R12	☆	☆	☆	☆	T-57S01
555.....	T-13R02	☆	☆	☆	☆	T-57S01
558.....	T-13R04	☆	☆	☆	☆	T-57S01
559.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
567.....	T-13R04	☆	☆	☆	☆	T-57S01
E-608.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
627.....	T-13R04	☆	☆	☆	☆	T-57S01
E648, 649.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
667, 708, 788, 808, 808A.....	T-13R03	☆	☆	☆	☆	T-57S01
710.....	T-13R09	T-13C30	☆	☆	T-33A91	T-13S41
725, P755.....	T-13R12	☆	☆	☆	☆	T-57S01
735.....	T-13R02	☆	☆	☆	☆	T-57S01
810.....	T-13R14	T-13C30	☆	☆	T-81D42	T-13S41
856, P875, 976.....	T-13R12	☆	☆	☆	☆	T-57S01
944.....	T-13R01	☆	☆	☆	☆	T-57S01

For complete description of these and other Thordarson transformers and chokes see catalog No. 400.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
AUDIOLA RADIO CO. (See also Fairbanks, Morse)						
4T-31, 4T-32						
6T Jr., 6T-31.....	T-13R05	☆	☆	☆	☆	T-57S01
7T, 8T, 9T.....	T-13R06	☆	☆	☆	☆	T-57S01
9T-45.....	T-13R06	☆	☆	☆	T-29A99	T-57S01
10T Super.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
13T-5.....	T-13R05	☆	☆	☆	☆	T-57S01
13S-9.....	T-13R06	T-13C29	T-18C92	☆	T-33A91	T-57S01
23T-5, 23T-5-SW						
23S-8.....	T-13R03	☆	☆	☆	☆	T-57S01
23S-8Q.....	T-13R05	☆	☆	☆	☆	T-57S01
23S-10.....	T-13R04	☆	☆	☆	☆	T-57S01
23S-12.....	T-13R04	T-75C51	☆	☆	T-67D47	T-57S01
30B, 31 Super.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
33S-10.....	T-13R04	☆	☆	☆	☆	T-57S01
889.....	T-56R01	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
7330.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
8430.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
BALKEIT RADIO CO.						
A-3, A-5, A-7.....	T-13R00	T-13C29	☆	T-29A99	T-33A91	§Special
C.....	T-13R06	T-13C30	T-13C29	☆	T-33A91	T-57S01
D-5.....	T-13R02	☆	☆	☆	☆	T-57S01
E.....	T-13R05	T-13C29	☆	☆	T-29A99	T-57S01
F.....	T-13R06	T-13C30	☆	☆	T-29A99	§Special
KP.....	T-13R03	☆	☆	☆	☆	T-57S01
L-7.....	T-13R04	☆	☆	☆	☆	T-57S01
L-8, Windsor 70....	T-13R06	T-13C29	☆	☆	T-33A91	T-57S01
G-18A, G-19B.....	T-13R12	T-13C29	☆	☆	☆	T-57S01
GT-20.....	T-13R13	T-13C30	☆	☆	☆	T-57S01
41A.....	T-13R12	T-13C29	☆	☆	☆	T-57S01
42-E, 42-C.....	T-13R01	☆	☆	☆	☆	T-57S01
60, 70.....	T-13R19	☆	☆	☆	☆	T-57S01
100.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
GT-200-X.....	T-13R13	T-13C30	☆	☆	☆	T-57S01
BELMONT RADIO CORP.						
40, 50, 50A-B-C, 60	T-13R02	☆	☆	☆	☆	T-57S01
40A.....	T-13R01	☆	☆	☆	☆	T-57S01
70.....	T-13R03	☆	☆	☆	☆	T-57S01
70A.....	T-13R05	☆	☆	☆	☆	T-57S01
71C.....	T-13R03	☆	☆	☆	☆	T-57S01
100.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
401.....	T-13R01	☆	☆	☆	☆	T-57S01
401B.....	T-13R19	☆	☆	☆	☆	T-57S01
408A.....	T-14R39	☆	☆	☆	☆	T-57S01
504A.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
517A, 526, 529.....	T-13R19	☆	☆	☆	☆	T-57S01
489A-B.....	T-14R39	☆	☆	☆	☆	T-57S01
527, 529.....	T-13R19	☆	☆	☆	☆	T-57S01
550.....	T-13R02	☆	☆	☆	☆	T-57S01
555, 556, 578.....	T-13R19	☆	☆	☆	☆	T-57S01
575.....	T-13R02	☆	☆	☆	☆	T-57S01
577.....	T-14R39	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
BELMONT RADIO CORP. (Contd)						
582 A & B, 583, 585 A-B-C, 586, 587, 588A, 589A.....	T-13R19	☆	☆	☆	☆	T-57S01
611.....	T-14R39	☆	☆	☆	T-78D46	T-81S01
629.....	T-13R19	☆	☆	☆	☆	T-57S01
640.....	T-13R03	☆	☆	☆	☆	T-57S01
665.....	T-13R11	☆	☆	☆	☆	T-57S01
675.....	T-13R02	☆	☆	☆	☆	T-57S01
685, 686.....	T-13R19	☆	☆	☆	☆	T-57S01
708.....	T-13R20	☆	☆	☆	☆	T-57S01
740, 777 B-C.....	T-13R13	☆	☆	☆	☆	T-57S01
746, 755, 777A.....	T-13R19	☆	☆	☆	☆	T-57S01
750.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
761.....	T-13R13	☆	☆	☆	☆	T-57S01
775.....	T-13R03	☆	☆	☆	☆	T-57S01
778.....	T-13R13	☆	☆	☆	☆	T-57S01
786.....	T-13R19	☆	☆	☆	☆	T-57S01
787A.....	T-13R12	T-13C28	☆	☆	☆	T-57S01
823.....	T-14R39	☆	☆	☆	T-78D46	T-81S01
840, 842, 860.....	T-13R13	☆	☆	☆	☆	T-57S01
867.....	T-13R12	☆	☆	☆	☆	T-57S01
878A.....	T-13R13	☆	☆	☆	☆	T-57S01
879A.....	T-13R19	☆	☆	☆	☆	T-57S01
888, 889.....	T-13R11	☆	☆	☆	☆	T-57S01
890A.....	T-13R12	☆	☆	☆	☆	T-57S01
1050.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
1070, 1170, 1171, 1172, 1174, 1175....	T-13R14	☆	☆	☆	T-17D01	T-13S41
1075.....	T-13R12	☆	☆	☆	☆	T-57S01
BOSCH (See United American Bosch)						
BREITING RADIO MFG. CO.						
Breiting 14.....	T-13R15	☆	☆	☆	☆	T-75S75
BRUNSWICK RADIO CORP.						
D.....	T-13R04	☆	☆	☆	☆	T-57S01
R-1.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	T-18C92
2-KR0, 3-KR0, 3-KR6, 5-KR, 5-KR0, 5-KR6.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	T-18C92
3-NC8, 5-NC8.....	T-13R00	T-13C29	T-13C29	☆	T-29A99	T-57S01
10.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
11, 12, 16, 18, 33....	T-13R04	☆	☆	☆	☆	T-57S01
14, 21, 31.....	T-13R06	T-13C30	T-13C30	T-29A99	T-33A91	T-57S01
S-14, S-21, S-31....	T-13R06	§Special	☆	☆	T-33A91	T-57S01
15, 22, 32, 42.....	T-13R06	T-13C29	☆	☆	☆	T-57S01
17, 24, 25.....	T-13R06	☆	☆	☆	☆	T-57S01
PR17-8.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	§Special
S-81, S-82.....	T-13R06	§Special	☆	☆	T-33A91	T-57S01
BULOVA WATCH CO.						
M-501.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
600, 601, 605, 610..	T-13R03	T-13C28	T-13C28	☆	☆	T-57S01
M-701.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
C-751.....	T-13R03	T-13C28	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
BUSH AND LANE PIANO COMPANY						
10.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
12 SG.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
CLARION (See Transformer Corp. of America)						
COLONIAL RADIO CORPORATION						
31AC.....	T-56R01	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
32AC.....	T-13R06	T-13C30	T-13C27	☆	T-33A91	T-57S01
32DC, 33DC.....	☆	T-18C92	T-74C30	☆	T-33A91	T-57S01
33, 34.....	T-56R05	T-13C30	☆	☆	T-33A91	T-57S01
36, 36P.....	T-13R06	T-74C30	☆	☆	§Special	T-57S01
37, 37P.....	T-13R05	☆	☆	☆	☆	T-57S01
38.....	T-13R06	T-74C30	☆	☆	§Special	T-57S01
39.....	T-13R02	☆	☆	☆	☆	T-57S01
41, 42.....	T-13R04	☆	☆	☆	☆	§Special
44.....	T-13R05	☆	☆	☆	☆	T-57S01
46.....	T-13R02	☆	☆	☆	☆	T-57S01
47, 48.....	T-56R05	☆	☆	☆	☆	T-57S01
49.....	T-13R03	☆	☆	☆	☆	T-57S01
51, 52.....	T-56R05	☆	☆	☆	☆	T-57S01
62.....	T-13R05	☆	☆	☆	☆	T-57S01
73.....	T-13R03	☆	☆	☆	☆	T-57S01
114, 117.....	T-13R06	T-74C30	☆	☆	§Special	T-57S01
125.....	T-13R02	☆	☆	☆	☆	T-57S01
250AC, 300AC, T345.....	T-13R19	☆	☆	☆	☆	T-57S01
T397.....	T-13R03	☆	☆	☆	☆	T-57S01
C399.....	T-13R12	☆	☆	☆	☆	T-57S01
C495.....	T-13R03	☆	☆	☆	☆	T-57S01
C595.....	T-56R05	☆	☆	☆	☆	T-57S01
600, 600A, 603.....	T-13R12	☆	☆	☆	☆	T-57S01
601.....	T-13R09	☆	☆	☆	☆	T-13S41
604, 605.....	T-13R08	☆	☆	☆	☆	T-57S01
650, 653.....	T-13R19	☆	☆	☆	☆	T-57S01
652.....	T-13R11	☆	☆	☆	☆	T-57S01
656.....	T-13R12	☆	☆	☆	☆	T-57S01
658.....	T-13R19	☆	☆	☆	☆	T-57S01
662.....	T-13R19	☆	☆	☆	☆	T-57S01
C695.....	T-56R05	☆	☆	☆	☆	T-57S01
COLUMBIA PHONOGRAPH COMPANY						
C-1, C-2, C-4.....	T-56R01	T-13C29	T-13C28	T-29A99	T-29A99	T-18C92
C-25-31, C-25-32.....	T-13R02	T-13C28	☆	☆	☆	T-57S01
C-31, C-32.....	T-13R02	T-13C28	☆	☆	☆	T-57S01
31, 33.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
32, 34.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
C-80.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
C-101.....	T-13R02	T-13C28	☆	☆	☆	T-57S01
C-102.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
C-800.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
920.....	T-13R06	☆	☆	T-29A99	T-33A91	T-57S01
930.....	T-13R07	☆	☆	T-29A99	T-33A91	T-57S01
990.....	T-13R06	☆	☆	T-29A99	T-33A91	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
CONTINENTAL RADIO & TELEVISION CORP.						
AM4.....	T-13R15	☆	☆	☆	☆	T-13S41
AM7.....	T-13R13	☆	☆	☆	☆	T-57S01
AM8-RF.....	T-13R19	T-13C26	☆	☆	☆	☆
M1.....	T-13R12	☆	☆	☆	☆	T-57S01
L2.....	T-13R12	T-13C28	☆	☆	☆	T-57S01
Z2.....	T-13R12	☆	☆	☆	☆	T-57S01
L4, ML4, L5.....	T-13R13	T-13C29	☆	☆	☆	T-57S01
5A, 5AZ, 5B, 5F, 5G, 5M, 5VU, 5X, 5Z.....	T-13R19	☆	☆	☆	☆	T-57S01
6B.....	T-13R19	☆	☆	☆	☆	T-57S01
6C, 6K, 6W.....	T-13R19	☆	☆	☆	☆	T-57S01
L6.....	T-13R14	T-13C30	☆	☆	☆	T-57S01
6PU.....	T-14R33	T-14C63	☆	☆	T-78D46	T-81S01
7C, 7H, 7C-PH, 7H-PH.....	T-13R12	☆	☆	☆	☆	T-57S01
7C.....	T-13R19	☆	☆	☆	☆	T-57S01
7M, 7MU, X8.....	T-13R12	☆	☆	☆	☆	T-57S01
8A.....	T-13R12	☆	☆	☆	☆	T-57S01
8C.....	T-13R12	☆	☆	☆	☆	T-57S01
8G.....	T-13R19	☆	☆	☆	☆	T-57S01
8K, 9C.....	T-13R13	☆	☆	☆	☆	T-57S01
11B, 11B-PH.....	T-13R14	☆	☆	☆	☆	T-57S01
16R.....	T-13R14	§Special	☆	☆	☆	T-13S41
A31.....	T-13R12	☆	☆	☆	☆	T-57S01
137X, 150X, 171X.....	T-13R13	☆	☆	☆	☆	T-57S01
150-5Z, 155-5Z, Chassis 5Z.....	T-13R19	☆	☆	☆	☆	T-57S01
ML-156.....	T-13R12	T-13C28	☆	☆	☆	T-57S01
160-5X, 165-6W.....	T-13R19	☆	☆	☆	☆	T-57S01
ML-266.....	T-13R12	T-13C28	☆	☆	☆	T-57S01
975-6W, 980-5X.....	T-13R19	☆	☆	☆	☆	T-57S01
985-5Z, 990-57.....	T-13R19	☆	☆	☆	☆	T-57S01
CROSLEY RADIO CORP.						
5M3, 5V2.....	T-13R19	☆	☆	☆	☆	T-57S01
6H3.....	T-13R12	☆	☆	☆	☆	T-57S01
30S, 31S, 33S, 34S.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
40S, 41S, 42S.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
41, 41A, 42.....	T-56R01	T-13C29	☆	T-29A99	T-33A91	T-57S01
48.....	T-13R03	☆	☆	☆	☆	T-57S01
50, 50LB, (5H1).....	T-13R19	☆	☆	☆	☆	T-57S01
53, 54, 57, 58, 59AC.....	T-13R05	T-13C29	☆	☆	☆	T-57S01
61.....	T-13R12	☆	☆	☆	☆	T-57S01
72, 72LB, (7H2).....	T-13R04	☆	☆	☆	☆	T-57S01
72, 72LB, (7H3).....	T-13R13	☆	☆	☆	☆	T-57S01
77-1, 77A-B-L.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
80AW, 8H1.....	T-13R13	T-13C29	☆	☆	☆	T-57S01
82S.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
84C, 84D.....	T-13R05	T-13C30	☆	☆	T-33A91	T-57S01
120.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
121 A-B.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
122.....	T-13R04	☆	☆	☆	☆	T-57S01
123, 124, 124-L.....	T-13R04	☆	☆	☆	T-33A91	T-57S01

Prices and dimensions for all transformers and chokes shown herein listed on page 3.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
CROSLEY RADIO CORP. (Contd)						
125.....	T-13R03	☆	☆	☆	☆	T-57S01
127, 127-1.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
129, 129-1.....	T-13R08	☆	☆	☆	☆	T-57S01
130, 130-1.....	T-13R18	☆	☆	☆	☆	T-57S01
131.....	T-13R02	☆	☆	☆	☆	T-57S01
133, 134.....	T-13R04	☆	☆	☆	☆	T-57S01
134-1.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
135.....	T-13R03	☆	☆	☆	☆	T-57S01
136-1.....	T-13R09	T-13C30	☆	☆	☆	T-57S01
137, 141.....	T-13R02	☆	☆	☆	☆	T-57S01
147.....	T-13R03	☆	☆	☆	☆	T-57S01
148, 150, 154.....	T-13R17	☆	☆	☆	☆	T-57S01
157.....	T-13R18	☆	☆	☆	☆	T-57S01
158.....	T-13R17	☆	☆	☆	☆	T-57S01
160, 161, 164.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
167.....	T-13R12	☆	☆	☆	☆	T-57S01
167 series 2, 168....	T-13R03	☆	☆	☆	☆	T-57S01
169.....	T-13R17	☆	☆	☆	☆	T-57S01
170, 171.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
175.....	T-13R07	T-13C30	☆	☆	☆	§Special
179.....	T-13R03	☆	☆	☆	☆	T-57S01
180.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
181.....	T-13R12	☆	☆	☆	☆	T-57S01
184.....	T-13R05	☆	☆	☆	☆	T-57S01
438.....	T-13R11	☆	☆	☆	☆	T-13S42
505, 515, 516.....	T-13R12	☆	☆	☆	☆	T-57S01
507.....	T-13R19	☆	☆	☆	☆	T-57S01
517.....	T-13R19	☆	☆	☆	☆	T-57S01
518.....	T-13R19	☆	☆	☆	☆	T-57S01
525.....	T-13R11	☆	☆	☆	☆	T-57S01
526.....	T-13R12	☆	☆	☆	☆	T-57S01
534.....	T-13R12	☆	☆	☆	T-33A91	T-57S01
537.....	T-13R11	☆	☆	☆	☆	T-57S01
547.....	T-13R19	☆	☆	☆	☆	T-57S01
555.....	T-13R12	☆	☆	☆	T-33A91	T-57S01
567.....	T-13R19	☆	☆	☆	☆	T-57S01
614, 616, 626.....	T-13R12	☆	☆	☆	☆	T-57S01
628.....	T-13R19	☆	☆	☆	☆	T-57S01
635, 636.....	T-13R12	☆	☆	☆	☆	T-57S01
637, 638.....	T-13R19	☆	☆	☆	☆	T-57S01
639.....	T-13R19	☆	☆	☆	☆	T-57S01
646.....	☆	☆	☆	☆	T-78D46	T-81S01
655, 656, 666.....	T-13R12	☆	☆	☆	☆	T-57S01
668.....	T-13R20	☆	☆	☆	☆	T-57S01
704, 706.....	T-56R01	T-13C29	☆	T-29A99	T-33A91	☆
714, 715, 716.....	T-13R13	☆	☆	☆	☆	T-57S01
718.....	T-13R19	☆	☆	☆	☆	T-57S01
725.....	T-13R12	☆	☆	☆	☆	T-57S01
726, 736.....	T-13R13	☆	☆	☆	☆	T-57S01
758.....	T-13R20	☆	☆	☆	☆	T-57S01
804.....	T-13R00	T-13C30	☆	T-29A99	T-33A91	☆

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
CROSLEY RADIO CORP. (Contd)						
814.....	T-13R13	T-13C29	☆	☆	☆	T-57S01
815.....	☆	☆	☆	T-29A99	T-78D46	T-81S01
816.....	T-13R14	☆	☆	☆	§Special	T-13S41
817.....	T-13R13	☆	☆	☆	☆	T-57S01
818.....	T-13R20	☆	☆	☆	☆	T-57S01
828.....	T-13R14	☆	☆	☆	☆	T-57S01
855, 865.....	T-13R12	☆	☆	☆	☆	T-57S01
915.....	T-13R13	☆	☆	☆	☆	T-57S01
916.....	T-13R13	T-13C29	☆	☆	T-33A91	T-57S01
926.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
955.....	T-13R14	☆	☆	☆	☆	T-57S01
1014.....	T-13R13	☆	☆	☆	T-33A91	T-57S01
1016, 1026.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
1055.....	T-13R14	☆	☆	☆	T-17D01	T-57S01
1117.....	T-13R13	☆	☆	☆	☆	T-57S01
1126.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
1155.....	T-13R14	☆	☆	☆	T-17D01	T-57S01
1216, 1336.....	T-13R15	☆	☆	☆	T-33A91	T-13S41
5515, 5516, 5526.....	T-13R12	☆	☆	☆	☆	T-57S01
5555, 5556, 5565....	T-13R12	☆	☆	☆	☆	T-57S01
5628.....	T-13R19	☆	☆	☆	☆	T-57S01
5666, 6516, 6625....	T-13R12	☆	☆	☆	☆	T-57S01
DELCO RADIO (See United Motors Service)						
DETROLA RADIO & TELEVISION CORP.						
4J.....	T-13R11	☆	☆	☆	☆	T-57S01
5B, 5D, 5W, 5X....	T-13R11	☆	☆	☆	☆	T-57S01
62M.....	T-13R11	☆	☆	☆	☆	T-57S01
7A, 7ZM.....	T-13R12	T-13C29	☆	☆	☆	T-57S01
102M.....	T-13R14	☆	☆	☆	☆	T-57S01
106.....	T-13R19	☆	☆	☆	☆	T-57S01
108, 146.....	T-13R12	☆	☆	☆	☆	T-57S01
147 series.....	T-13R13	☆	☆	☆	☆	T-57S01
155X, 165.....	T-13R13	☆	☆	☆	☆	T-57S01
163.....	T-13R15	☆	☆	☆	☆	§Special
178.....	T-13R11	☆	☆	☆	☆	T-57S01
184.....	T-14R39	☆	☆	☆	☆	T-57S01
206.....	T-13R11	☆	☆	☆	☆	T-57S01
258, 259.....	T-13R12	☆	☆	☆	☆	T-13S41
276.....	T-13R12	☆	☆	☆	☆	T-57S01
315, 325.....	T-13R12	☆	☆	☆	☆	T-13S41
326.....	T-13R12	☆	☆	☆	☆	T-13S41
503.....	T-13R02	☆	☆	☆	☆	T-57S01
1900.....	T-13R11	☆	☆	☆	☆	T-57S01
THOMAS A. EDISON, INC.						
C4, R4, R5.....	T-56R05	T-13C30	☆	T-29A99	T-58A70	T-57S01
R6, R7.....	T-56R05	T-13C30	T-13C28	☆	T-33A91	T-57S01
E-175, Abbey Jr....	T-56R01	T-13C29	☆	T-29A99	T-29A99	§Special
EMERSON RADIO & PHONOGRAPH CORP.						
CS.....	T-13R02	☆	☆	☆	☆	T-57S01
F.....	T-13R06	T-13C30	☆	☆	T-29A99	T-57S01
JS.....	T-13R02	☆	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
EMERSON RADIO & PHONOGRAPH CORP. (Contd)						
KS.....	T-13R04	☆	☆	☆	☆	T-57S01
T, TS.....	T-13R02	☆	☆	☆	☆	T-57S01
L-AC-4.....	T-13R01	☆	☆	☆	☆	T-57S01
L-AC-5, M-AC-7...	T-13R02	☆	☆	☆	☆	T-57S01
AW7.....	T-13R13	☆	☆	☆	§Special	T-57S01
23 (4B).....	T-13R12	☆	☆	☆	☆	T-57S01
26.....	T-13R02	☆	☆	☆	☆	T-57S01
28 (5J).....	T-13R11	☆	☆	☆	☆	T-57S01
34C (C6), 36 (B5)...	T-13R12	☆	☆	☆	☆	T-57S01
39 (DS-5).....	T-13R02	☆	☆	☆	☆	T-57S01
45 (6-BD).....	T-13R12	☆	☆	☆	☆	T-57S01
50L, 50M, S-50, D55	T-13R02	☆	☆	☆	☆	T-57S01
AW-55.....	T-13R05	☆	☆	☆	☆	T-57S01
59.....	T-13R02	☆	☆	☆	☆	T-57S01
65.....	T-13R04	T-13C29	☆	☆	T-33A91	§Special
71.....	T-13R13	☆	☆	☆	§Special	T-57S01
77.....	T-13R02	☆	☆	☆	☆	T-57S01
101.....	T-13R12	☆	☆	☆	☆	T-57S01
102 (A8), 102LW (B8), 104, 104LW...	T-13R13	☆	☆	☆	☆	T-57S01
105.....	T-13R16	T-67C49	☆	☆	T-17D01	T-13S41
K116 (K).....	T-13R12	☆	☆	☆	☆	T-57S01
116.....	T-13R11	☆	☆	☆	☆	T-57S01
117, L117, 117LW, Z117, (KS, Z)	T-13R12	☆	☆	☆	☆	T-57S01
121, K121.....	T-13R12	☆	☆	☆	☆	T-57S01
L122, L122LW, Z122	T-13R12	☆	☆	☆	☆	T-57S01
K123.....	T-13R12	☆	☆	☆	☆	T-57S01
L133, L133LW, Z133	T-13R12	☆	☆	☆	☆	T-57S01
C134, C136, C138, C139, C140, D134, D136, D138, D139, D140, D142.....	T-13R13	☆	☆	☆	☆	T-57S01
D134LW, D136LW, D138LW, D139LW, D140LW, D142LW, D146LW.....	T-13R14	T-13C30	☆	☆	☆	T-57S01
L135, L135LW, Z135	T-13R12	☆	☆	☆	☆	T-57S01
L141, L141LW, Z141	T-13R12	☆	☆	☆	☆	T-57S01
C142.....	T-13R13	☆	☆	☆	☆	T-57S01
L143.....	T-13R12	☆	☆	☆	☆	T-57S01
X143(X), X146.....	T-13R15	☆	☆	☆	☆	T-57S01
SI47, Z150, S151(S)	T-13R12	☆	☆	☆	☆	T-57S01
D146.....	T-13R15	☆	☆	☆	☆	T-57S01
R152, R153, R156, R158.....	T-13R19	☆	☆	☆	☆	T-57S01
Z159, Z160, AT170, (AT).....	T-13R12	☆	☆	☆	☆	T-57S01
AR171, AR172, AR173.....	T-13R12	☆	☆	☆	☆	T-57S01
AR174, AR176, AR180.....	T-13R12	☆	☆	☆	☆	T-57S01
AW171, AW173, AW174, AW176, AW180.....	T-13R12	☆	☆	☆	☆	T-57S01
X175, X178, X183..	T-13R15	☆	☆	☆	☆	T-57S01
AB178, AB182, AB183, AB184 (AB)	T-13R15	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
EMERSON RADIO & PHONOGRAPH CORP. (Contd)						
AT181, AR185.....	T-13R12	☆	☆	☆	☆	T-57S01
AW185 (AW).....	T-13R13	☆	☆	☆	☆	T-57S01
R189.....	T-13R19	☆	☆	☆	☆	T-57S01
AZ196 (AZ).....	T-13R11	☆	☆	☆	☆	T-57S01
BE198 (BE).....	T-13R19	☆	☆	☆	☆	T-57S01
BL200, BL210, BL214(BL) AC202	T-13R19	☆	☆	☆	☆	T-57S01
BL218, BL220 (BL)	T-13R19	☆	☆	☆	☆	T-57S01
BQ223 (BQ).....	T-13R11	☆	☆	☆	☆	T-57S01
BR224 (BR).....	T-13R15	☆	☆	☆	☆	T-13S41
BQ225, BQ228 (BQ)	T-13R11	☆	☆	☆	☆	T-57S01
BR226, BS227, BR, BS.....	T-13R15	☆	☆	☆	☆	T-13S41
BU229, BU230, BU	T-13R11	☆	☆	☆	☆	T-57S01
BW231 (BW).....	T-13R11	☆	☆	☆	☆	T-57S01
CB243 (CB).....	T-13R11	☆	☆	☆	☆	T-57S01
287 (DA).....	T-13R11	☆	☆	☆	☆	T-13S42
L755, M755, S755..	T-13R02	☆	☆	☆	☆	T-57S01
770.....	T-13R13	☆	☆	☆	§Special	T-57S01
ERLA (See also Sentinel)						
Erla.....	T-56R01	T-13C29	☆	T-29A99	T-33A91	☆
S. W. Converter....	T-13R01	☆	☆	☆	☆	T-57S01
AR3.....	T-13R07	T-13C30	T-13C29	☆	T-33A91	T-57S01
A13 Amp.....	T-13R05	T-13C29	T-74C30	☆	T-29A99	T-57S01
30.....	T-13R05	☆	☆	☆	☆	T-57S01
31, 32.....	T-13R07	T-13C30	T-13C29	☆	T-33A91	T-57S01
35, 37, 38, 39.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
61, 62, 63.....	T-13R03	☆	☆	☆	☆	T-57S01
75.....	☆	☆	☆	T-29A99	T-33A91	T-57S01
77.....	☆	☆	☆	T-29A99	T-33A91	T-57S01
81P.....	T-13R05	☆	☆	☆	☆	T-57S01
224AC, 224B.....	T-13R06	T-13C30	T-18C92	☆	T-33A91	T-57S01
231.....	☆	☆	☆	T-29A99	T-33A91	T-57S01
245.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
248K.....	T-13R05	☆	☆	☆	☆	T-57S01
250.....	T-13R03	☆	☆	☆	☆	T-57S01
271, 271A.....	T-13R05	T-13C29	☆	☆	T-29A99	T-57S01
335.....	T-13R01	☆	☆	☆	☆	T-57S01
5700, 5721.....	T-13R02	☆	☆	☆	☆	T-57S01
6300, 6315, 6317, 6323.....	T-13R02	☆	☆	☆	☆	T-57S01
FADA RADIO & ELEC. CORP.						
6A51.....	T-13R11	☆	☆	☆	☆	T-13S42
6A65.....	T-13R12	☆	☆	☆	☆	T-13S42
6A80.....	T-13R13	☆	☆	☆	☆	T-13S42
10, 11.....	T-13R00	T-13C27	T-13C27	T-29A99	T-29A99	☆
16, 17, 20.....	T-13R00	T-13C27	T-13C27	T-29A99	T-33A91	§Special
25.....	T-13R06	T-13C29	☆	T-29A99	T-33A91	§Special
30, 31.....	T-13R00	T-13C27	T-13C27	T-29A99	T-29A99	☆
32.....	T-13R00	T-13C27	T-13C27	T-29A99	T-33A91	§Special
35.....	T-13R06	T-13C29	☆	T-29A99	T-33A91	§Special
40.....	T-13R06	T-13C29	☆	T-29A99	T-33A91	§Special



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
FADA RADIO & ELEC. CORP. (Contd)						
41, 42, 43, 44 (KF).....	T-13R06	T-13C29	☆	☆	T-33A91	T-57S01
45KU.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
46, 47, 48, 49KW....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
50.....	T-13R00	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
51(KO), 53-55(RG).....	T-13R05	☆	☆	☆	☆	T-57S01
57(KOC), 61, 66, KX.....	T-13R05	☆	☆	☆	☆	T-57S01
64APC, 65PC.....	T-13R12	☆	☆	☆	☆	T-13S42
A66T, A66PC.....	T-13R12	☆	☆	☆	☆	T-13S42
66KY.....	T-13R07	☆	☆	☆	☆	T-57S01
73.....	T-13R07	☆	☆	☆	☆	T-57S01
74, 76, 78.....	T-13R07	☆	☆	☆	T-33A91	T-57S01
78-10.....	T-13R15	☆	☆	☆	T-33A91	T-57S01
79.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
79 RC.....	T-13R07	☆	☆	☆	T-33A91	T-57S01
79-10.....	T-13R15	☆	☆	☆	T-33A91	T-57S01
83.....	T-13R07	☆	☆	☆	T-33A91	T-57S01
85RE, 85RX.....	T-13R07	☆	☆	☆	☆	T-57S01
88, 89.....	T-13R07	☆	☆	☆	T-33A91	T-57S01
97-10 (RW).....	T-13R15	☆	☆	☆	T-33A91	T-57S01
122 Batt. (KE)....	☆	☆	☆	T-29A99	T-33A91	T-57S01
126, 127, 128 NK....	☆	☆	☆	T-29A99	T-78D46	T-81S01
133, 134, 135, 136....	T-13R15	☆	☆	☆	T-33A91	T-57S01
141 (NA).....	T-13R12	☆	☆	☆	☆	T-57S01
150, 151, 152, 160....	T-13R12	☆	☆	☆	☆	T-57S01
170.....	T-13R13	☆	☆	☆	§Special	T-57S01
E180.....	T-13R00	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
190.....	T-13R13	☆	☆	☆	§Special	☆
211 AC.....	T-13R15	☆	☆	☆	☆	T-13S41
212.....	T-13R13	T-13C30	☆	☆	☆	T-13S41
250.....	T-13R12	☆	☆	☆	☆	T-57S01
255, 265.....	T-13R12	☆	☆	☆	☆	T-57S01
270, 271(NF).....	T-13R12	☆	☆	☆	☆	T-57S01
290, 291, 312.....	T-13R15	☆	☆	☆	☆	T-13S41
365, 366, 366PT....	T-13R12	☆	☆	☆	☆	T-13S42
380.....	T-13R12	☆	☆	☆	☆	T-13S42
410.....	T-13R13	☆	☆	☆	☆	T-13S42
413.....	T-13R14	T-13C28	☆	☆	☆	T-13S41
451, 454.....	T-13R19	☆	☆	☆	☆	T-13S42
465.....	T-13R12	☆	☆	☆	☆	T-13S42
472-CA, 472-UA....	T-56R02	☆	☆	T-29A99	T-29A99	☆
475-CA, 475-UA....	T-56R02	☆	☆	T-29A99	T-29A99	☆
761(KC), 762, 764, 766, 767.....	T-13R05	T-13C29	☆	☆	T-29A99	☆
1255, 1265.....	T-13R12	☆	☆	☆	☆	T-57S01
1582, 1583.....	T-13R13	☆	☆	☆	§Special	T-57S01

FAIRBANKS MORSE & COMPANY

4A, 4B.....	T-14R39	T-14C61	☆	☆	☆	T-13S43
5A, 5B.....	T-13R11	☆	☆	☆	☆	T-57S01
5C, 6A.....	T-13R12	☆	☆	☆	☆	T-57S01
6C.....	§Special	T-13C27	☆	☆	T-78D46	T-81S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
FAIRBANKS MORSE & COMPANY (Contd)						
7A.....	T-13R20	☆	☆	☆	☆	T-57S01
8A, 9A.....	T-13R13	☆	☆	☆	☆	T-13S42
9C.....	T-13R14	☆	☆	☆	☆	T-13S41
12A, 12B.....	T-13R15	☆	☆	☆	☆	T-13S41
40.....	T-13R19	☆	☆	☆	☆	T-57S01
51, 52, 53.....	T-13R02	☆	☆	☆	☆	T-57S01
54, 56.....	T-13R12	☆	☆	☆	☆	T-57S01
57, 57T0.....	T-13R19	☆	☆	☆	☆	T-57S01
58.....	T-13R19	☆	☆	☆	☆	T-57S01
58(T1), 58(T2).....	T-13R11	☆	☆	☆	☆	T-57S01
63, 66.....	T-13R12	☆	☆	☆	☆	T-57S01
70, 71.....	T-13R12	☆	☆	☆	☆	T-57S01
72-C-2, 72-C-3, 72-T-3.....	T-13R13	☆	☆	☆	☆	T-13S42
73, 73C3B, 73T3B... §Special	T-13C27	☆	☆	☆	T-78D46	T-81S01
82, 83, 84, 85.....	T-13R13	☆	☆	☆	T-33A91	T-57S01
90.....	T-13R13	☆	☆	☆	T-33A91	T-57S01
91, 91C4, 91C5, 91T4.....	T-13R13	☆	☆	☆	☆	T-13S41
100, 110.....	T-13R09	T-13C30	T-13C29	☆	T-67D78	T-13S41
5106, 5107, 5108....	T-13R02	☆	☆	☆	☆	T-57S01
5109, 5111, 5112....	T-13R02	☆	☆	☆	☆	T-57S01
5141, 5143.....	T-13R02	☆	☆	☆	☆	T-57S01
5212, 5212A, 5241, 5312, 5312A, 5341..	T-13R02	☆	☆	☆	☆	T-57S01
6010, 6044, 7014....	T-13R12	☆	☆	☆	☆	T-57S01
7040, 7052.....	T-13R12	☆	☆	☆	☆	T-57S01

FREED RADIO & TELEVISION CORP.

MB5.....	T-13R02	T-13C27	☆	☆	☆	T-57S01
MB7.....	T-13R03	☆	☆	☆	☆	T-57S01
MB9.....	T-13R04	T-13C30	☆	☆	T-33A91	T-57S01
54.....	T-13R02	T-13C27	☆	☆	☆	T-57S01
55NR.....	T-56R01	T-13C29	T-13C29	T-29A99	T-33A91	☆
56.....	T-13R02	T-13C27	☆	☆	☆	T-57S01
57NR.....	T-56R01	T-13C27	T-13C27	T-29A99	T-29A99	☆
58-59.....	T-13R02	T-13C27	☆	☆	☆	T-57S01
60NR.....	T-56R01	T-13C27	T-13C27	T-29A99	T-29A99	☆
66 (NR).....	T-56R01	T-13C29	T-13C29	T-29A99	T-33A91	☆
72-74.....	T-13R03	☆	☆	☆	☆	T-57S01
78NR, 79NR.....	T-13R06	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
80 NR.....	T-56R01	T-13C27	T-13C27	T-29A99	T-29A99	§Special
90.....	T-13R04	T-13C30	☆	☆	T-33A91	T-57S01
NR90S.....	T-13R06	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
92.....	T-13R03	☆	☆	☆	☆	T-57S01
95NR.....	T-13R06	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
96DC.....	☆	T-13C30	☆	☆	T-33A91	T-57S01
98FE.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
346-4.....	T-13R19	☆	☆	☆	☆	T-57S01
354-360-360X.....	T-13R12	☆	☆	☆	☆	T-57S01

CALVIN MFG. CO. (MOTOROLA)

5T.....	T-13R19	☆	☆	☆	☆	T-57S01
5T-1, 5T-2, 5Y....	T-13R12	☆	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
GALVIN MFG. CO. (MOTOROLA) (Contd)						
5-1.....	T-13R19	☆	☆	☆	☆	T-57S01
5-2.....	T-13R12	☆	☆	☆	☆	T-57S01
6-1, 6-A.....	T-13R12	☆	☆	☆	☆	T-57S01
6T, 6Y, 6-2.....	T-13R12	☆	☆	☆	☆	T-13S42
10-1, 10Y.....	T-13R13	☆	☆	☆	☆	T-13S42
59F1.....	T-13R12	☆	☆	☆	☆	T-13S42
59K1, 59R2.....	T-13R11	☆	☆	☆	☆	T-57S01
59R4.....	T-13R11	☆	☆	☆	☆	T-57S01
59T2, 59T4, 59T5..	T-13R11	☆	☆	☆	☆	T-57S01
61C, 61D.....	T-13R19	☆	☆	☆	☆	T-57S01
61CA, 61DA.....	T-13R19	☆	☆	☆	☆	T-57S01
69K1 early & late..	T-13R13	☆	☆	☆	☆	T-57S01
81C.....	T-13R12	☆	☆	☆	☆	T-57S01
GAMBLE-SKOGMO, INC.						
07A.....	T-13R12	☆	☆	☆	☆	T-57S01
2-ODM-578.....	T-13R09	☆	☆	☆	T-57A41	T-13S41
7J512-7J574.....	T-13R12	☆	☆	☆	☆	T-57S01
20C7, 20C8.....	T-13R09	☆	☆	☆	T-57A41	T-13S41
30A.....	T-13R12	☆	☆	☆	☆	T-57S01
47LL, 47R, 47RL..	T-13R13	☆	☆	☆	☆	T-57S01
51C.....	T-13R02	☆	☆	☆	☆	T-57S01
70.....	T-13R05	☆	☆	☆	☆	T-57S01
71C.....	T-13R03	☆	☆	☆	☆	T-57S01
72 (CH, 8, 8X) 85..	T-13R06	T-13C29	☆	☆	☆	T-57S01
425, 457.....	T-13R02	☆	☆	☆	☆	T-57S01
460.....	T-13R12	☆	☆	☆	☆	T-57S01
510-511.....	T-13R19	☆	☆	☆	☆	T-57S01
521.....	T-13R19	☆	☆	☆	☆	T-57S01
521Z.....	T-56R05	T-57C54	☆	☆	T-67D78	T-13S41
525.....	T-13R02	☆	☆	☆	☆	T-57S01
527A, 527C.....	T-13R19	☆	☆	☆	☆	T-57S01
550AC.....	T-13R03	☆	☆	☆	☆	T-57S01
575.....	T-13R02	☆	☆	☆	☆	T-57S01
578.....	T-13R12	☆	☆	☆	☆	T-57S01
585, 586A, 587A....	T-13R19	☆	☆	☆	☆	T-57S01
589.....	T-13R19	☆	☆	☆	☆	T-57S01
600, 623, 645.....	T-13R19	☆	☆	☆	☆	T-57S01
648.....	T-13R12	☆	☆	☆	☆	T-13S42
665, 765.....	T-13R19	☆	☆	☆	☆	T-57S01
675.....	T-13R03	☆	☆	☆	☆	T-57S01
675A, 685B.....	T-13R11	☆	☆	☆	☆	T-57S01
690B.....	T-13R20	☆	☆	☆	☆	T-57S01
715B.....	T-13R13	☆	☆	☆	☆	T-57S01
735.....	T-13R12	☆	☆	☆	☆	T-13S42
740.....	T-13R13	☆	☆	☆	☆	T-57S01
750.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
761A.....	T-13R13	☆	☆	☆	☆	T-57S01
762.....	T-13R13	☆	☆	☆	☆	T-57S01
767.....	T-13R13	☆	☆	☆	☆	T-13S42
770, 774.....	T-13R13	☆	☆	☆	☆	T-57S01
777C, 777L, 778A..	T-13R13	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
GAMBLE-SKOGMO, INC. (Contd)						
787.....	T-13R19	☆	☆	☆	☆	T-57S01
810.....	T-13R12	☆	☆	☆	☆	T-57S01
864, 867A.....	T-13R13	☆	☆	☆	☆	T-57S01
907.....	T-13R19	☆	☆	☆	☆	T-57S01
908.....	T-13R12	☆	☆	☆	☆	T-57S01
970.....	T-13R19	☆	☆	☆	☆	T-57S01
1050.....	T-13R07	☆	☆	☆	T-81D52	T-13S41
1070.....	T-13R14	☆	☆	☆	T-17D01	T-57S01
2078D.....	T-13R03	☆	☆	☆	☆	T-57S01
2516.....	T-13R05	☆	☆	☆	☆	T-57S01
4954.....	T-13R16	☆	☆	☆	☆	T-13S41
GAROD RADIO CORP.						
2B2, 2B2-1.....	T-14R39	T-14C61	☆	☆	T-78D46	T-81S01
2B6, 2B6-1.....	T-14R39	T-14C61	☆	☆	T-78D46	T-81S01
25, 26, 27.....	T-13R12	☆	☆	☆	☆	T-57S01
49, 49M.....	T-13R09	☆	☆	☆	T-33A91	T-57S01
73, 73LW.....	T-13R12	☆	☆	☆	☆	T-57S01
150.....	T-13R19	☆	☆	☆	☆	T-57S01
205C, 205L.....	T-13R11	☆	☆	☆	☆	T-57S01
205-1.....	T-13R11	☆	☆	☆	☆	T-57S01
206C, 206L, 206P4..	T-13R11	☆	☆	☆	☆	T-57S01
206-1, 250.....	T-13R11	☆	☆	☆	☆	T-57S01
307, 307E.....	T-13R12	☆	☆	☆	☆	T-13S42
309 series, 380....	T-13R13	☆	☆	☆	☆	T-13S42
380D, 380KC.....	T-13R13	☆	☆	☆	☆	T-13S42
381, 381D.....	T-13R13	☆	☆	☆	☆	T-13S42
381KC.....	T-13R13	☆	☆	☆	☆	T-13S42
389.....	T-13R20	☆	☆	☆	☆	T-57S01
399.....	T-13R12	☆	☆	☆	☆	T-57S01
511A.....	T-13R09	☆	☆	☆	T-33A91	T-57S01
511G, 511P.....	T-13R09	T-13C30	☆	☆	T-33A91	T-57S01
930 series.....	☆	T-13C27	☆	☆	T-33A91	T-57S01
931 series.....	☆	T-13C27	☆	☆	T-33A91	T-57S01
1540.....	T-13R15	☆	☆	☆	☆	T-13S41
3012 series.....	T-13R14	☆	☆	☆	☆	T-13S42
3016.....	T-13R16	☆	☆	☆	☆	T-13S41
3109.....	T-13R12	☆	☆	☆	☆	T-57S01
4012 series.....	T-13R14	☆	☆	☆	☆	T-13S42
4016-4.....	T-13R16	☆	☆	☆	☆	T-13S41
4110 series.....	T-13R08	☆	☆	☆	☆	T-57S01
5140.....	T-13R15	☆	☆	☆	☆	T-13S41
GENERAL ELECTRIC CO.						
T-12, T-12E.....	T-13R04	☆	☆	☆	☆	T-57S01
S-22, S-22A, S-22X.	T-13R13	☆	☆	☆	☆	T-57S01
H-31.....	T-13R06	T-13C30	☆	☆	T-57A42	T-57S01
H-32, T-41.....	T-13R07	☆	☆	☆	T-13A36	T-57S01
F-40.....	T-13R11	☆	☆	☆	☆	T-57S01
S-42, SZ-42F.....	T-13R07	☆	☆	☆	T-13A35	T-57S01
G-50.....	T-13R11	☆	☆	☆	☆	T-57S01
K-50, K-50P.....	T-13R05	☆	☆	☆	☆	T-57S01
M-50.....	T-13R13	☆	☆	☆	☆	T-57S01

Tropex transformers will stay put on those tough replacement jobs. See page 32.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
GENERAL ELECTRIC CO. (Contd)						
H-51, H-51R.....	T-13R06	☆	☆	☆	§Special	§Special
K-51, K-51P.....	T-13R05	☆	☆	☆	☆	T-57S01
M-51, M-51A.....	T-13R13	☆	☆	☆	☆	T-57S01
A-52, E-52, M-52...	T-13R12	☆	☆	☆	☆	T-57S01
K-52.....	T-13R05	☆	☆	☆	☆	T-57S01
A-53, F-53, G-53...	T-13R12	☆	☆	☆	☆	T-57S01
K-53, K-53M.....	T-13R05	☆	☆	☆	☆	T-57S01
K-54, K-54P.....	T-13R05	☆	☆	☆	☆	T-57S01
A-55.....	T-13R12	☆	☆	☆	☆	T-57S01
G-55.....	T-13R11	☆	☆	☆	☆	T-57S01
K-55.....	T-13R05	☆	☆	☆	☆	T-57S01
M-55, M-56.....	T-13R13	☆	☆	☆	☆	T-57S01
G-56, G-57.....	T-13R12	☆	☆	☆	☆	T-57S01
K-60, K-60P.....	T-13R04	☆	☆	☆	☆	T-57S01
E-61.....	T-13R12	☆	☆	☆	☆	T-57S01
G-61.....	T-13R20	☆	☆	☆	☆	T-57S01
M-61, E-62.....	T-13R12	☆	☆	☆	☆	T-57S01
K-62, KZ-62P.....	T-13R07	☆	☆	☆	☆	T-57S01
M-62.....	T-13R13	☆	☆	☆	☆	T-57S01
A-63, F-63.....	T-13R12	☆	☆	☆	☆	T-57S01
K-63.....	T-13R04	☆	☆	☆	☆	T-57S01
A-64.....	T-13R13	☆	☆	☆	☆	T-57S01
G-64.....	T-13R20	☆	☆	☆	☆	T-57S01
K-64.....	T-13R05	☆	☆	☆	☆	T-57S01
A-65, F-65.....	T-13R13	☆	☆	☆	☆	T-57S01
K-65, K-65P.....	T-13R04	☆	☆	☆	☆	T-57S01
M-65.....	T-13R05	☆	☆	☆	☆	T-57S01
A-66, F-66.....	T-13R12	☆	☆	☆	☆	T-57S01
G-66.....	T-13R20	☆	☆	☆	☆	T-57S01
K-66, K-66M.....	T-13R03	☆	☆	☆	☆	T-57S01
M-66.....	T-13R13	☆	☆	☆	☆	T-57S01
A-67, M-67.....	T-13R13	☆	☆	☆	☆	T-57S01
E-68.....	T-13R12	☆	☆	☆	☆	T-57S01
G-68.....	T-13R20	☆	☆	☆	☆	T-57S01
M-68.....	T-13R05	☆	☆	☆	☆	T-57S01
G-69.....	T-13R20	☆	☆	☆	☆	T-57S01
M-69.....	T-13R13	☆	☆	☆	☆	T-57S01
A-70.....	T-13R12	☆	☆	☆	☆	T-57S01
F-70.....	T-13R13	☆	☆	☆	☆	T-57S01
J-70.....	T-13R04	☆	☆	☆	T-13A34	T-57S01
E-71, E-72.....	T-13R13	☆	☆	☆	☆	T-57S01
H-71.....	T-13R06	☆	☆	☆	§Special	§Special
H-72.....	T-13R07	☆	☆	☆	☆	T-57S01
J-72.....	T-13R05	☆	☆	☆	T-13A34	T-57S01
H73, H77, H78.....	T-13R19	☆	☆	☆	☆	T-13S42
F-74, A-75, F-75...	T-13R13	☆	☆	☆	☆	T-57S01
G-75.....	T-13R11	☆	☆	☆	☆	T-57S01
J-75.....	T-13R04	☆	☆	☆	T-13A34	T-57S01
E-76.....	T-13R13	☆	☆	☆	☆	T-57S01
G-76.....	T-13R11	☆	☆	☆	☆	T-57S01
F-77.....	T-13R13	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
GENERAL ELECTRIC CO. (Contd)						
H-77, G-78.....	T-13R20	☆	☆	☆	☆	T-57S01
E-79.....	T-13R12	☆	☆	☆	☆	T-57S01
H-79.....	T-13R20	☆	☆	☆	☆	T-57S01
K-79.....	T-13R04 T-13C29	☆	☆	☆	§Special	T-13S41
F-80.....	T-13R13	☆	☆	☆	☆	T-57S01
HM80.....	T-13R19	☆	☆	☆	☆	T-13S42
J-80, K-80, K-80X...	T-13R07	☆	☆	☆	T-13A34	T-57S01
E-81, F-81.....	T-13R14	☆	☆	☆	☆	T-57S01
M-81.....	T-13R15	☆	☆	☆	T-13A35	T-57S01
A-82.....	T-13R13	☆	☆	☆	☆	T-57S01
J-82.....	T-13R07	☆	☆	☆	T-13A34	T-57S01
A-83.....	T-13R13	☆	☆	☆	T-13A35	T-57S01
J-83, J-83A.....	T-13R05	☆	☆	☆	T-13A35	T-57S01
A-85.....	T-13R13	☆	☆	☆	T-13A35	T-57S01
F-85.....	T-13R13	☆	☆	☆	☆	T-57S01
G-85.....	T-13R20	☆	☆	☆	☆	T-57S01
K-85.....	T-13R07 T-13C30	☆	☆	☆	§Special	T-57S01
M-85.....	T-13R15	☆	☆	☆	T-13A35	T-57S01
E-86, F-86.....	T-13R14	☆	☆	☆	☆	T-57S01
G-86.....	T-13R20	☆	☆	☆	☆	T-57S01
J-86.....	T-13R07	☆	☆	☆	T-13A34	T-57S01
M-86.....	T-13R15	☆	☆	☆	T-13A35	T-57S01
A-87.....	T-13R13	☆	☆	☆	T-13A35	T-57S01
J-87, J-87A.....	T-13R05	☆	☆	☆	T-13A35	T-57S01
F-88.....	T-13R13	☆	☆	☆	☆	T-57S01
K-88, K-88X.....	T-13R07 T-13C30	☆	☆	☆	§Special	T-57S01
M-89.....	T-13R15	☆	☆	☆	T-13A35	T-57S01
E-91.....	T-41187	☆	☆	☆	☆	T-13S41
H-91, H-91R.....	T-13R06	☆	☆	☆	T-13A35	T-57S01
F-96.....	T-13R13	☆	☆	☆	☆	T-57S01
G-99.....	T-13R20	☆	☆	☆	☆	T-57S01
J-100.....	T-56R05 T-13C30	☆	☆	☆	§Special	T-13S41
E-101, E-105.....	T-41187	☆	☆	☆	☆	T-13S41
G-105, G-106.....	T-41187	☆	☆	☆	☆	T-13S41
K-105.....	T-13R06	☆	☆	☆	T-13A35	T-57S01
E-106.....	T-41187†	☆	☆	☆	☆	T-13S41
M-106.....	T-13R15	☆	☆	T-33A91	T-13A36	T-57S01
J-107, J-109.....	T-56R05 T-13C30	☆	☆	☆	§Special	T-13S41
K-107.....	T-13R06	☆	☆	☆	T-13A35	T-13S41
H-116, H-118.....	T-13R15	☆	☆	☆	☆	T-13S41
A-125.....	T-13R15	☆	☆	☆	☆	T-13S41
GM-125.....	T-13R16 T-13C30	☆	☆	☆	☆	T-13S41
M-125.....	T-13R15	☆	☆	T-33A91	T-13A36	T-57S01
M-128, M-128HR..	T-13R07 T-13C30	☆	☆	T-33A91	§Special	T-13S41
M-129.....	T-13R15	☆	☆	T-33A91	T-13A36	T-57S01
S-132.....	T-13R07	☆	☆	☆	T-33A91	T-57S01
HM136.....	T-13R15	☆	☆	☆	☆	T-13S41
GENERAL HOUSEHOLD UTILITIES CO.						
450, (4A) 451.....	T-13R12	☆	☆	☆	☆	T-57S01
460X.....	T-13R12	☆	☆	☆	☆	T-57S01
460 (4B).....	T-13R19	☆	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99, †\$10.00 List. Order only from your distributor.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
GENERAL HOUSEHOLD UTILITIES CO. (Contd)						
461, 461X.....	T-13R12	☆	☆	☆	☆	T-57S01
470 (4C).....	T-13R12	☆	☆	☆	☆	T-57S01
500 (5A).....	T-13R08	☆	☆	☆	☆	T-57S01
532 (5H).....	T-13R19	☆	☆	☆	☆	T-57S01
542 (5J) 551.....	T-13R11	☆	☆	☆	☆	T-57S01
553, 555 (5L).....	T-13R11	☆	☆	☆	☆	T-57S01
560.....	T-13R12	☆	☆	☆	☆	T-57S01
564 (5R), 566 (5S)...	T-13R19	☆	☆	☆	☆	T-57S01
570, 571.....	T-13R12	☆	☆	☆	☆	T-57S01
572, 573 (5Q).....	T-13R11	☆	☆	☆	☆	T-57S01
576 (5T), 578.....	T-13R11	☆	☆	☆	☆	T-57S01
580, 581.....	T-13R12	☆	☆	☆	☆	T-57S01
583 (5W), 585, 586..	T-13R11	☆	☆	☆	☆	T-57S01
587 (5U), 589 (5P) .	T-13R12	☆	☆	☆	☆	T-57S01
599, 639 (6m).....	T-13R12	☆	☆	☆	☆	T-57S01
632 (6H).....	T-13R12	☆	☆	☆	☆	T-57S01
640 (6J), 641.....	T-13R12	☆	☆	☆	☆	T-57S01
643.....	T-13R12	☆	☆	☆	☆	T-57S01
650 (6A), 651.....	T-13R12	☆	☆	☆	☆	T-57S01
661, 662.....	T-13R12	☆	☆	☆	☆	T-57S01
663 (6E).....	T-13R12	☆	☆	☆	☆	T-57S01
664 (6N), 660 (6C) .	T-13R12	☆	☆	☆	☆	T-57S01
670 (6D), 671.....	T-13R12	☆	☆	☆	☆	T-57S01
680, 681.....	T-13R12	☆	☆	☆	☆	T-57S01
700 (7A), 701.....	T-13R12 T-13C29	☆	☆	☆	☆	T-57S01
723 (7M), 731.....	T-13R12	☆	☆	☆	☆	T-57S01
733, 735.....	T-13R12	☆	☆	☆	☆	T-57S01
750, 751.....	T-13R12	☆	☆	☆	☆	T-57S01
752, 753 (7B), 755..	T-13R12	☆	☆	☆	☆	T-57S01
760, 761 (7C).....	T-13R13	☆	☆	☆	☆	T-57S01
801 (8A).....	T-13R13	☆	☆	☆	☆	T-57S01
821.....	T-13R13	☆	☆	☆	☆	T-57S01
823 (8H), 831.....	T-13R12	☆	☆	☆	☆	T-57S01
833, 835.....	T-13R12	☆	☆	☆	☆	T-57S01
861.....	T-13R13 T-13C29	☆	☆	☆	☆	T-57S01
871 (8E).....	T-13R14	☆	☆	☆	T-33A91	T-57S01
901 (9A), 902.....	T-13R08 T-13C29	☆	☆	☆	T-33A91	T-57S01
941 (9E).....	T-13R13	☆	☆	☆	T-33A91	T-57S01
1067 (10D).....	T-13R14	☆	☆	☆	T-33A91	T-57S01
1091 (10G).....	T-13R15	☆	☆	☆	☆	T-57S01
1151 (11A, 11B) 11.2	T-13R09 T-13C30	☆	☆	☆	T-17D01	T-13S41
1162.....	T-13R09 T-13C30	☆	☆	☆	T-17D01	T-13S41
1171.....	T-13R15	☆	☆	☆	T-81D52	T-13S41
1191 (11C), 1191B..	T-13R13	☆	☆	☆	T-33A91	T-57S01
1181 (11H), 1183, 1185.....	T-13R15	☆	☆	☆	☆	T-57S01
1241.....	T-13R15	☆	☆	☆	T-81D52	§Special
1291, 1297 (12B)...	T-13R15	☆	☆	☆	☆	T-13S41
1541.....	T-13R16 T-13C30	☆	☆	☆	T-17D01	T-13S41
GENERAL MOTORS RADIO CORP.						
A.....	T-13R06 T-13C30 T-74C30	☆	☆	☆	T-33A91	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
GENERAL MOTORS RADIO CORP. (Contd)						
25, 26, 27, 28, 43, 48	T-56R01	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
110.....	T-13R03	☆	☆	☆	☆	T-57S01
120, 130, 140.....	T-13R06	T-13C30	T-13C27	☆	T-33A91	T-57S01
180, 190, 211 (S9A, S9B) MA....	T-13R03	☆	☆	☆	☆	T-57S01
216, 217, 219.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
220, (S10A, S10B)...	T-13R04	☆	☆	☆	☆	T-57S01
250, 251, (A2A, S2B)	T-13R04	T-13C29	☆	☆	☆	T-57S01
252 (S3A, S3B).....	T-13R06	T-13C30	T-13C27	☆	T-57A42	T-57S01
253, 254, 255.....	T-13R06	T-13C30	T-13C27	☆	T-57A42	T-57S01
257, 258.....	T-13R06	T-13C30	T-13C27	☆	T-57A42	T-57S01
292, 293 (S4A, S4B)	T-13R06	T-13C30	T-13C27	☆	T-57A42	T-57S01
A5003.....	T-56R03	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
A5005.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
5065AC.....	T-56R01	T-13C28	T-13C28	T-29A99	T-29A99	T-18C92
5069, 5080.....	T-56R01	T-13C29	☆	T-29A99	T-33A91	§Special
5091.....	T-56R03	T-13C29	T-13C29	T-29A99	T-33A91	T-57S01
GILFILLAN BROS.						
5B8, 5C8, 5S8.....	T-13R12	☆	☆	☆	☆	T-57S01
5SJ.....	T-13R19	☆	☆	☆	☆	T-57S01
6C, 6T.....	T-13R03	☆	☆	☆	☆	T-57S01
6X8.....	T-13R12	☆	☆	☆	☆	T-57S01
7T8.....	T-13R13	☆	☆	☆	☆	T-57S01
8C, 8T.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
8C8, 8T8.....	T-13R12	☆	☆	☆	☆	T-57S01
33, 35.....	T-13R00	T-13C29	☆	T-29A99	T-33A91	T-57S01
42A.....	T-13R19	☆	☆	☆	☆	T-57S01
43A.....	T-13R01	☆	☆	☆	☆	T-57S01
47, 50.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
52A, 54A.....	T-13R12	☆	☆	☆	☆	T-57S01
56S.....	T-13R11	☆	☆	☆	☆	T-57S01
62BX, 63, 63BX...	T-13R12	☆	☆	☆	☆	T-57S01
63X.....	T-13R12	☆	☆	☆	☆	T-57S01
78B, 78X.....	T-13R12	☆	☆	☆	☆	T-57S01
100.....	T-13R04	T-13C29	T-13C29	☆	T-29A99	T-57S01
105, 106.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
116B, 116X, 117B..	T-13R15	T-13C29	☆	☆	☆	T-57S01
117X.....	T-13R15	T-13C29	☆	☆	☆	T-57S01
402T.....	T-13R11	☆	☆	☆	☆	T-57S01
410, 412T.....	T-13R01	☆	☆	☆	☆	T-57S01
501T.....	T-13R12	☆	☆	☆	☆	T-57S01
510.....	T-13R01	☆	☆	☆	☆	T-57S01
515.....	T-13R12	☆	☆	☆	☆	T-57S01
520.....	T-13R01	☆	☆	☆	☆	T-57S01
521TC, 525.....	T-13R12	☆	☆	☆	☆	T-57S01
615, 625.....	T-13R03	☆	☆	☆	☆	T-57S01
711T.....	T-13R12	☆	☆	☆	☆	T-57S01
715, 725.....	T-13R13	☆	☆	☆	T-33A91	T-57S01
731TC.....	T-13R12	☆	☆	☆	☆	T-57S01
815, 825.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
831TC.....	T-13R12	☆	☆	☆	☆	T-57S01

Dual Tone Control permits changing audio frequencies to suit every requirement. Fully described in Thordarson Amplifier Guide No. 346. Postpaid 15 cents.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
GILFILLAN BROS. (Contd)						
1131C.....	T-13R15	☆	☆	§Special	T-13A36	T-57S01
1331C.....	T-13R14	☆	☆	☆	T-13A36	T-57S01
A. H. GREBE & CO.						
AH1.....	T-56R05	T-13C28	☆	☆	T-57A42	T-57S01
HS3.....	T-13R03	☆	☆	☆	☆	T-57S01
HS4, (1 pentode)...	T-13R04	T-13C29	☆	☆	☆	T-57S01
HS4 (pp 45 or 47)...	T-13R06	T-13C30	☆	☆	T-57A42	T-57S01
SK4.....	T-13R06	T-13C30	☆	☆	T-57A42	T-57S01
AC7.....	T-56R01	T-13C29	☆	T-29A99	T-29A99	☆
HS7, HS8.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
HS11, HS12.....	☆	T-13C30	☆	☆	T-33A91	T-57S01
89.....	T-13R04	☆	☆	☆	☆	T-57S01
111B.....	T-13R07	T-67C49	☆	☆	T-67D78	T-13S41
GRIGSBY-GRUNOW CO. (See also Majestic)						
15, 15B.....	T-13R03	☆	☆	☆	☆	T-57S01
20, 21, 22, 23.....	T-13R07	T-13C30	T-13C30	☆	T-57A42	T-57S01
25, 25B.....	T-56R05	T-13C30	T-74C30	☆	T-74A31 T-74C30	T-57S01
30.....	T-13R06	T-13C29	☆	☆	T-57A42	T-57S01
31.....	T-13R05	T-13C29	☆	☆	T-57A42	T-57S01
35.....	T-56R05	T-13C30	☆	☆	T-57A42 T-74C30	T-57S01
44, 49.....	T-13R11	☆	☆	☆	☆	T-57S01
50.....	T-13R06	T-13C29	☆	☆	T-57A42	T-57S01
51.....	T-13R04	T-13C28	☆	☆	T-57A42	T-57S01
52.....	T-13R06	T-13C29	☆	☆	T-57A42	T-57S01
55.....	T-13R12	☆	☆	☆	☆	T-57S01
56, 57, 58.....	T-13R03	☆	☆	☆	☆	T-57S01
59.....	T-13R12	☆	☆	☆	☆	T-57S01
60.....	T-56R05	T-13C30	T-13C29	☆	T-57A42	T-57S01
70.....	T-56R01	T-13C29	☆	T-29A99	T-33A91	T-57S01
71, 72.....	T-56R01	T-13C28	☆	T-29A99	T-33A91	T-57S01
75.....	T-13R02	☆	☆	☆	☆	T-57S01
77.....	T-13R03	☆	☆	☆	☆	T-13S41
85, 86.....	T-13R04	☆	☆	☆	T-67D47	T-57S01
90, 90B.....	T-13R07	T-13C30	T-13C30	☆	T-57A42	T-57S01
91, 92, 93.....	T-13R04	T-13C30	☆	☆	T-57A42	T-57S01
100B.....	T-13R07	T-13C30	T-13C30	☆	T-57A42	T-57S01
101, 102, 103.....	T-13R04	T-13C30	☆	☆	T-57A42	T-57S01
130A, 131, 132.....	T-13R07	T-13C30	T-13C30	☆	T-57A42	T-57S01
150, 151, 153, 154, 155, 156.....	T-13R03	☆	☆	☆	☆	T-57S01
159.....	T-13R12	☆	☆	☆	☆	T-57S01
160.....	T-56R05	T-13C30	T-13C29	☆	T-57A42	T-57S01
194.....	T-13R11	☆	☆	☆	☆	T-57S01
195.....	T-13R02	☆	☆	☆	☆	T-57S01
200, 201, 203, 204..	T-13R04	T-13C29	☆	☆	☆	T-57S01
210, 211, 214, 215..	T-13R06	T-13C30	☆	☆	T-74A31	T-57S01
230, 233.....	T-13R04	☆	☆	☆	☆	T-57S01
251, 251B, 253, 253B, 254, 254B.....	T-13R04	T-13C30	☆	☆	T-13A35	T-57S01
310A, 310B, 311, 314, 315.....	T-13R03	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
GRIGSBY-GRUNOW CO. (Contd)						
330, 331, 336.....	T-13R03	☆	☆	☆	☆	T-57S01
351, 352, 353.....	T-13R04	☆	☆	☆	T-13A35	T-57S01
360, 363.....	T-13R06	☆	☆	☆	☆	T-13S41
370, 371, 373.....	T-13R03	☆	☆	☆	☆	T-57S01
390, 393.....	T-13R04	☆	☆	☆	T-67D47	T-57S01
440.....	T-13R11	☆	☆	☆	☆	T-57S01
460, 461, 463.....	T-13R03	☆	☆	☆	☆	T-57S01
500.....	T-13R12	☆	☆	☆	☆	T-57S01
560, 566.....	T-13R12	☆	☆	☆	☆	T-57S01
570.....	T-13R03	☆	☆	☆	☆	T-57S01
800, 998.....	T-13R04	☆	☆	☆	T-67D47	T-57S01
GULBRANSEN CO.						
10, 13.....	T-13R05	☆	☆	☆	☆	T-57S01
23.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
60 Champion Jr., 63	T-13R04	☆	☆	☆	T-33A91	T-57S01
160, 161.....	T-13R06	T-13C29	☆	☆	T-33A91	T-57S01
200, 291, 292, 295...	T-56R03	T-13C29	☆	☆	T-33A91	T-57S01
352.....	T-13R02	☆	☆	☆	☆	T-57S01
872.....	T-13R03	☆	☆	☆	☆	T-57S01
9950.....	T-56R03	T-13C29	☆	☆	T-33A91	T-57S01
THE HALLICRAFTERS, INC.						
5T.....	T-13R12	☆	☆	☆	☆	T-57S01
H8PA.....	T-13R19	☆	☆	☆	☆	§Special
S8A, S9, SK9.....	T-13R13	T-13C30	☆	☆	☆	T-57S01
S10.....	T-13R12	☆	☆	☆	☆	T-57S01
S11 Super Sky Rider	T-13R14	T-13C30	☆	☆	T-33A91	☆
S12 Comm. Sky....	T-13R14	T-13C30	☆	☆	T-33A91	☆
S14 Sky Chief, Sky Buddy.....	T-13R12	☆	☆	☆	☆	T-57S01
S15 Sky Challenger.	T-13R13	T-13C28	☆	☆	☆	☆
SX16 Super Sky Rider 38.....	T-13R14	T-13C30	☆	☆	T-33A91	☆
SX17.....	T-13R14	T-13C30	☆	☆	T-33A91	T-13S41
S19R Sky Buddy...	T-13R19	☆	☆	☆	☆	T-57S01
SX23, SX24.....	T-13R12	☆	☆	☆	☆	T-57S01
HAMMARLUND MFG. CO.						
Comet Pro st'd Xtal	T-13R04	T-13C29	T-13C29	☆	☆	☆
Comet Pro Dec. '31	T-13R05	T-13C29	☆	☆	☆	T-57S01
HOWARD RADIO CO.						
AVH, EX (Dual Range).....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
D, F Radio D, F Audio Amp....	T-13R13	☆	☆	☆	☆	T-57S01
H.....	T-13R05	T-13C29	☆	☆	T-33A91	T-57S01
SG "A".....	T-13R06	T-13C30	☆	☆	T-57A42	T-57S01
SG "B," O.....	T-13R05	T-13C29	☆	☆	T-29A99	T-57S01
SG "C".....	T-13R06	T-13C30	☆	☆	T-57A42	T-57S01
S "T".....	T-13R05	☆	☆	☆	☆	T-57S01
X3.....	T-13R12	T-13C29	☆	☆	☆	T-57S01
Z4.....	T-13R09	☆	☆	☆	§Special	T-57S01
6B, 6BA, 7BT.....	T-14R39	T-14C63	☆	☆	T-78D46	T-81S01
Green Diamond "B" (71's).....	T-56R01	T-13C29	☆	T-29A99	T-33A91	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
HOWARD RADIO CO. (Contd)						
Green Diamond (45's).....	T-56R03	T-13C30	☆	T-29A99	T-33A91	T-57S01
X8.....	T-13R12	T-13C29	☆	☆	☆	T-57S01
R9.....	T-13R14	T-13C30	☆	☆	T-33A91	T-57S01
20, 25, 32.....	T-13R05	T-13C29	☆	☆	T-33A91	T-57S01
35, 40.....	T-13R05	T-13C29	☆	☆	T-33A91	T-57S01
67C, 67T, 68.....	T-13R12	☆	☆	☆	☆	T-13S42
77C, 77T.....	T-13R12	☆	☆	☆	☆	T-57S01
99C, 99T.....	T-13R14	☆	☆	☆	☆	T-57S01
118, 218.....	T-13R14	☆	☆	☆	☆	T-57S01
218.....	T-13R13	☆	☆	☆	☆	T-57S01
220, 225, 225S.....	T-13R19	☆	☆	☆	☆	T-57S01
240-1, 240-2.....	T-13R19	☆	☆	☆	☆	T-57S01
250, S250.....	T-13R19	☆	☆	☆	☆	T-57S01
256, S256.....	T-13R12	☆	☆	☆	☆	T-13S42
E256, 260, S260.....	T-13R19	☆	☆	☆	☆	T-57S01
266.....	T-13R12	☆	☆	☆	☆	T-57S01
268, 275C, 275T.....	T-13R12	☆	☆	☆	☆	T-13S42
280.....	T-13R12	☆	☆	☆	☆	T-13S42
300.....	T-13R19	☆	☆	☆	☆	T-57S01
301, 303.....	T-13R12	☆	☆	☆	☆	T-13S42
302S, 302APC.....	T-13R12	☆	☆	☆	☆	T-13S42
305, 306, 307.....	T-13R11	☆	☆	☆	☆	T-57S01
318.....	T-13R13	☆	☆	☆	☆	T-13S41
318D.....	T-13R11	☆	☆	☆	☆	T-13S41
325.....	T-13R13	☆	☆	☆	☆	T-13S41
325D.....	T-13R11	☆	☆	☆	☆	T-13S41
368.....	T-13R12	☆	☆	☆	☆	T-13S42
375.....	T-13R12	☆	☆	☆	☆	T-13S42
377.....	T-13R19	☆	☆	☆	☆	T-57S01
400.....	T-13R13	☆	☆	☆	☆	T-13S41
400X.....	T-13R14	☆	☆	☆	☆	T-13S41
425.....	T-13R15	☆	☆	☆	T-74C30	T-13S41
430.....	T-13R11	☆	☆	☆	☆	T-57S01
438.....	T-13R20	☆	☆	☆	☆	T-57S01
468.....	T-13R20	☆	☆	☆	☆	T-57S01
518.....	T-13R14	☆	☆	☆	☆	T-13S41
520.....	T-13R15	☆	☆	☆	☆	T-13S41
525.....	T-13R16	☆	☆	☆	☆	T-13S42
568.....	T-13R14	☆	☆	☆	☆	T-13S41
1626.....	T-13R12	☆	☆	☆	☆	T-13S42
COLIN B. KENNEDY CORP.						
10.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
20.....	T-13R05	T-13C29	☆	☆	T-33A91	T-57S01
26.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
30, 32.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
42, 42B.....	T-13R05	☆	☆	☆	☆	T-57S01
50.....	T-13R03	☆	☆	☆	☆	T-57S01
52.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
55.....	T-13R01	☆	☆	☆	☆	T-57S01
56.....	T-13R04	☆	☆	☆	T-33A91	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
COLIN B. KENNEDY CORP. (Contd)						
60.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
62, 62A.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
63, 63A.....	T-13R02	☆	☆	☆	☆	T-57S01
80.....	T-56R01	T-13C29	☆	☆	☆	T-57S01
563A.....	T-13R02	☆	☆	☆	☆	T-57S01
826B.....	T-13R05	☆	☆	☆	T-33A91	T-57S01
882-62D.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
882-64C.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
KOLSTER RADIO INC. (Brandes)						
A-1.....	T-13R05	☆	☆	☆	☆	☆
6J, 6K, 6L, 6M, 6R	T-56R01	T-13C29	T-13C28	☆	T-29A99	T-18C92
B10, B11, B12.....	T-13R09	§Special	T-13C28	T-29A99	T-33A91	☆
B15, B16.....	T-13R00	T-13C29	☆	T-33A91	T-33A91	T-57S01
K20, K21, K22, K23	T-56R01	T-13C29	T-18C92	T-29A99	T-29A99	T-18C92
K25, K27, K37.....	T-56R01	T-13C29	T-18C92	T-29A99	T-29A99	T-18C92
K43, K43A.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
K60.....	T-13R07	T-13C29	☆	☆	☆	T-57S01
K70.....	T-13R07	T-13C29	☆	☆	☆	T-57S01
K73.....	☆	T-13C27	☆	☆	☆	T-57S01
80.....	T-13R07	T-13C27	☆	☆	T-33A91	T-57S01
K83.....	☆	T-13C30	T-13C29	☆	T-33A91	T-57S01
90.....	T-13R07	T-13C27	☆	☆	T-33A91	T-57S01
K93.....	☆	T-13C30	T-13C29	☆	T-33A91	T-57S01
K110, K120, K122.....	T-13R03	☆	☆	☆	☆	T-57S01
K130, K132.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
K140, K142.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
MAJESTIC RADIO & TELEVISION CO.						
1A50 series.....	T-13R19	☆	☆	☆	☆	T-57S01
1A59, 1A59B, 1A59	T-13R19	☆	☆	☆	☆	T-57S01
1B59, 1B59B.....	T-13R19	☆	☆	☆	☆	T-57S01
2A50 series.....	T-13R19	☆	☆	☆	☆	T-57S01
3C70, 3C80.....	T-13R11	☆	☆	☆	☆	T-57S01
3C80.....	T-13R11	☆	☆	☆	☆	T-57S01
3C90.....	T-13R12	☆	☆	☆	☆	T-57S01
5BDA, 5BEA.....	T-13R19	☆	☆	☆	☆	T-57S01
56, 62A.....	T-13R19	☆	☆	☆	☆	T-57S01
65, 66.....	T-13R12	☆	☆	☆	☆	T-57S01
67, 68.....	T-13R20	☆	☆	☆	☆	T-57S01
75, 76.....	T-13R12	☆	☆	☆	☆	T-57S01
85, 86.....	T-13R14	☆	☆	☆	☆	T-57S01
511, 511A, 519P.....	T-13R19	☆	☆	☆	☆	T-57S01
551, 620.....	T-13R19	☆	☆	☆	☆	T-57S01
639, 639B.....	T-13R19	☆	☆	☆	☆	T-57S01
650.....	T-13R12	☆	☆	☆	☆	T-57S01
739, 750.....	T-13R12	☆	☆	☆	☆	T-57S01
850.....	T-13R14	☆	☆	☆	☆	T-57S01
939.....	T-13R13	☆	☆	☆	☆	T-57S01
1050.....	T-13R15	☆	☆	☆	T-17D01	T-13S41
1056X.....	T-13R20	☆	☆	☆	☆	T-57S01
1058X.....	T-13R20	☆	☆	☆	☆	T-57S01
1250.....	T-13R15	☆	☆	☆	T-17D01	T-13S41

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
MAJESTIC RADIO & TELEVISION CO. (Contd)						
1356X.....	T-13R15	☆	☆	☆	☆	T-13S41
1870.....	T-13R20	☆	☆	☆	☆	T-57S01
MONTGOMERY WARD & CO.						
04WG-725.....	T-13R19	☆	☆	☆	☆	T-57S01
11.....	T-56R05 T-13C30	☆	☆	☆	☆	T-57S01
15, 16.....	T-13R02	☆	☆	☆	☆	T-57S01
17.....	T-13R06	☆	☆	☆	☆	T-57S01
21, 22.....	T-13R06 T-13C29	☆	☆	T-33A91	☆	T-57S01
62-010.....	T-13R03 T-13C28	☆	☆	T-33A91	☆	T-57S01
62-020.....	T-13R06 T-13C29 T-18C92	☆	☆	T-33A91	☆	T-57S01
62-030, 62-040.....	T-13R04 T-13C29	☆	☆	T-33A91	☆	T-57S01
62-060, 62-070.....	T-13R02 T-13C28	☆	☆	☆	☆	T-57S01
62-7, 62-8.....	T-13R05	☆	☆	☆	☆	T-57S01
62-9.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
62-14.....	T-56R05 T-13C30	☆	☆	☆	☆	T-57S01
62-20.....	T-56R05	☆	☆	☆	☆	T-57S01
62-25.....	T-56R05	☆	☆	☆	☆	T-57S01
62-26.....	T-56R05	☆	☆	☆	☆	T-57S01
62-29.....	T-56R02	☆	☆	☆	☆	T-57S01
62-30.....	T-13R06 T-13C29	☆	☆	T-33A91	☆	T-57S01
62-34.....	T-13R03 T-13C29	☆	☆	☆	☆	T-57S01
62-38, 62-40.....	T-56R05	☆	☆	☆	T-33A91	T-57S01
62-PC43.....	T-13R02	☆	☆	☆	☆	T-57S01
62-50.....	T-56R05	☆	☆	☆	T-33A91	T-57S01
62-70, 62-70X.....	T-13R05	☆	☆	☆	☆	T-57S01
62-72X.....	T-13R05	☆	☆	☆	☆	T-57S01
62-97, 62-97X.....	T-13R02	☆	☆	☆	☆	T-57S01
62-99, 62-99X.....	T-13R02	☆	☆	☆	☆	T-57S01
62-101, 62-101X.....	T-13R04 T-13C29	☆	☆	T-33A91	☆	T-57S01
62-103, 62-105.....	T-13R13	☆	☆	☆	☆	T-57S01
62-106, 62-107.....	T-13R07 T-13C30	☆	☆	T-33A91	☆	T-57S01
62-121.....	T-13R07 T-13C30	☆	☆	T-33A91	☆	T-57S01
62-131.....	T-13R13	☆	☆	☆	☆	T-57S01
62-132.....	T-13R09	☆	☆	☆	T-33A91	T-57S01
62-133.....	T-13R13	☆	☆	☆	☆	T-57S01
62-135.....	T-13R02	☆	☆	☆	☆	T-57S01
62-140, 62-140X.....	T-13R02	☆	☆	☆	☆	T-57S01
62-142.....	T-13R13	☆	☆	☆	☆	T-57S01
62-144.....	T-13R13	☆	☆	☆	☆	T-57S01
62-147.....	T-13R12	☆	☆	☆	§Special	T-57S01
62-148, 62-148X.....	T-13R02	☆	☆	☆	☆	T-57S01
62-150.....	T-13R02	☆	☆	☆	☆	T-57S01
62-152.....	T-13R12	☆	☆	☆	☆	T-57S01
62-154.....	T-13R02	☆	☆	☆	☆	T-57S01
62-156.....	T-13R12	☆	☆	☆	☆	T-57S01
62-164.....	T-13R12	☆	☆	☆	☆	T-57S01
62-173, 62-175.....	T-13R13	☆	☆	☆	☆	T-57S01
62-176.....	T-13R13	☆	☆	☆	☆	T-57S01
62-177.....	T-13R12	☆	☆	☆	☆	T-57S01
62-179.....	T-13R09	☆	☆	☆	T-33A91	T-57S01
62-181.....	T-13R04 T-13C29	☆	☆	T-33A91	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
MONTGOMERY WARD & CO. (Contd)						
62-185, 62-187, 62-190.....	T-13R13	☆	☆	☆	☆	T-57S01
62-193.....	T-13R13	☆	☆	☆	☆	T-57S01
62-194.....	T-13R09	☆	☆	☆	T-33A91	T-57S01
62-196.....	T-13R13	☆	☆	☆	☆	T-57S01
62-206, 62-216.....	T-13R09	☆	☆	☆	T-33A91	T-57S01
62-218.....	T-13R09	☆	☆	☆	T-33A91	T-57S01
62-226, 62-228.....	T-13R12	☆	☆	☆	☆	T-57S01
62-232.....	T-13R04 T-13C29	☆	☆	☆	T-33A91	T-57S01
62-233, 62-235.....	T-13R12	☆	☆	☆	☆	T-57S01
62-248, 62-259.....	T-13R12	☆	☆	☆	☆	T-57S01
62-261.....	T-13R14	☆	☆	☆	§Special	T-57S01
62-267.....	T-13R12	☆	☆	☆	☆	T-57S01
62-274, 62-276.....	T-13R19	☆	☆	☆	☆	T-57S01
62-277.....	T-13R12	☆	☆	☆	☆	T-57S01
62-280.....	T-14R39	☆	☆	☆	☆	T-57S01
62-288.....	T-13R19	☆	☆	☆	☆	T-57S01
62-290.....	T-13R19	☆	☆	☆	☆	T-57S01
62-297.....	T-13R12	☆	☆	☆	☆	T-57S01
62-301, 62-301X.....	T-13R13	☆	☆	☆	☆	T-13S41
62-304.....	T-14R39 T-14C63	☆	☆	☆	☆	T-13S43
62-306.....	T-13R19	☆	☆	☆	☆	T-57S01
62-307.....	T-13R11	☆	☆	☆	☆	T-57S01
62-308.....	T-13R12	☆	☆	☆	☆	T-57S01
62-309.....	T-13R13	☆	☆	☆	☆	T-57S01
62-311.....	T-13R14	☆	☆	☆	§Special	T-57S01
62-315.....	T-13R19	☆	☆	☆	☆	T-57S01
62-316.....	T-13R11	☆	☆	☆	☆	T-57S01
62-318.....	T-13R12	☆	☆	☆	☆	T-57S01
62-321, 62-451.....	T-13R12	☆	☆	☆	☆	T-57S01
62-323.....	T-13R20	☆	☆	☆	☆	T-57S01
62-324.....	T-13R20	☆	☆	☆	☆	T-57S01
62-345.....	T-14R39 T-14C63	☆	☆	☆	☆	T-13S43
62-346, 62-350.....	T-13R19	☆	☆	☆	☆	T-57S01
62-347.....	T-13R12	☆	☆	☆	☆	T-57S01
62-351, 62-352.....	T-13R19	☆	☆	☆	☆	T-57S01
62-357.....	T-13R12	☆	☆	☆	☆	T-57S01
62-361, 62-362.....	T-13R11	☆	☆	☆	☆	T-57S01
62-367.....	T-13R12	☆	☆	☆	☆	T-57S01
62-370.....	T-13R19	☆	☆	☆	☆	T-57S01
62-372.....	T-13R11	☆	☆	☆	☆	T-57S01
62-380.....	T-13R19	☆	☆	☆	☆	T-57S01
62-390.....	T-13R11	☆	☆	☆	☆	T-57S01
62-401, 62-402.....	T-13R13	☆	☆	☆	☆	T-13S41
62-403.....	T-13R15	☆	☆	☆	☆	T-13S41
62-404.....	T-14R39 T-14C63	☆	☆	☆	☆	T-13S43
62-406.....	T-13R19	☆	☆	☆	☆	T-57S01
62-407.....	T-13R11	☆	☆	☆	☆	T-57S01
62-408.....	T-13R12	☆	☆	☆	☆	T-57S01
62-411.....	T-13R14	☆	☆	☆	§Special	T-57S01
62-415.....	T-13R19	☆	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
MONTGOMERY WARD & CO. (Contd)						
62-416.....	T-13R11	☆	☆	☆	☆	T-57S01
62-418.....	T-13R12	☆	☆	☆	☆	T-57S01
62-425.....	T-13R19	☆	☆	☆	☆	T-57S01
62-445, 62-455.....	T-13R19	☆	☆	☆	☆	T-57S01
62-449.....	T-13R13	☆	☆	☆	☆	T-57S01
62-457.....	T-13R12	☆	☆	☆	☆	T-57S01
62-465.....	T-14R39	T-14C63	☆	☆	☆	T-13S43
62-467.....	T-13R12	☆	☆	☆	☆	T-57S01
62-471, 62-472.....	T-13R19	☆	☆	☆	☆	T-57S01
62-473.....	T-13R13	☆	☆	☆	☆	T-13S42
62-475, 62-476.....	T-13R19	☆	☆	☆	☆	T-57S01
62-479.....	T-13R19	☆	☆	☆	☆	T-57S01
62-490.....	T-13R11	☆	☆	☆	☆	T-57S01
62-497.....	T-13R12	☆	☆	☆	☆	T-57S01
62-500, 62-601.....	T-13R19	☆	☆	☆	☆	T-57S01
62-606, 62-616.....	T-13R19	☆	☆	☆	☆	T-57S01
62-700.....	T-13R19	☆	☆	☆	☆	T-57S01
62-701, 62-702, 62-703.....	T-13R11	☆	☆	☆	☆	T-57S01
62-704.....	T-13R20	☆	☆	☆	☆	T-57S01
62-712.....	T-13R20	☆	☆	☆	☆	T-57S01
62-900.....	T-13R11	☆	☆	☆	☆	T-57S01
62-1100, 62-1101.....	T-13R13	☆	☆	☆	☆	T-13S41
62-1611.....	T-13R06	☆	☆	☆	☆	T-57S01
62-1711.....	T-13R06	☆	☆	☆	☆	T-57S01
62-1838.....	T-13R06	☆	☆	☆	☆	T-57S01
93BR-71HB.....	T-13R20	☆	☆	☆	☆	T-57S01
93BR-391A.....	T-13R20	☆	☆	☆	☆	T-57S01
93BR-714A.....	T-13R20	☆	☆	☆	☆	T-57S01
93BR-715B 93BR-716A.....	T-13R20	☆	☆	☆	☆	T-57S01
93BR-717A.....	T-13R20	☆	☆	☆	☆	T-57S01
93BR-1201A.....	T-13R14	☆	☆	☆	☆	T-57S01
93WG-382.....	T-13R12	☆	☆	☆	☆	T-13S42
93WG-800..... 93WG-801, 93WG-802, 93WG-805, 93WG-1000, 93WG-1001.....	T-13R12 T-13R15	☆ ☆	☆ ☆	☆ ☆	☆ ☆	T-57S01 T-13S41
93WG-1103, 93WG-1104.....	T-13R12	☆	☆	☆	☆	T-57S01
811, 1111, 1238.....	T-13R06	☆	☆	☆	☆	T-57S01
1355.....	T-13R06	T-13C30	☆	☆	☆	T-33A91
1800.....	T-56R02	T-13C28	☆	☆	☆	T-57S01
1955.....	T-13R06	T-13C30	☆	☆	☆	T-33A91
2822, 2827, 2895 2897.....	T-13R05	T-13C29	☆	☆	☆	T-33A91
2955X, 2957X.....	T-13R06	T-13C30	☆	☆	☆	T-33A91
3035, 3037, 3065, 3067.....	T-13R04	T-13C29	☆	☆	☆	T-33A91
10,000.....	T-13R05	T-13C29	☆	T-29A99	T-33A91	T-57S01
11,000, 14,000.....	T-13R04	T-13C29	☆	☆	☆	T-33A91
62,000.....	T-13R04	T-13C29	☆	☆	☆	T-33A91

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
MOTOROLA (See Galvin Mfg. Co.)						
PHILCO RADIO & TELEVISION CORP.						
5.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	T-18C92
12TP.....	T-13R11*	☆	☆	☆	☆	T-57S01
14, 15.....	T-13R15	T-13C30	☆	☆	☆	T-81D42
16, 17.....	T-13R16	T-13C30	☆	☆	☆	T-81D42
18.....	T-13R15	T-13C30	☆	☆	☆	T-81D42
19.....	T-13R13	☆	☆	☆	☆	T-57S01
20, 20A.....	T-13R00	T-13C29	☆	☆	☆	T-33A91
21.....	T-13R04	T-13C30	☆	☆	☆	§Special
22L.....	T-13R13	☆	☆	☆	☆	T-57S01
23X, 29.....	T-13R14	T-13C30	☆	☆	☆	T-33A91
37-62.....	T-13R12	☆	☆	☆	☆	T-57S01
37-84.....	T-13R12	☆	☆	☆	☆	T-57S01
37-93.....	T-13R12	☆	☆	☆	☆	T-57S01
37-600.....	T-13R12	☆	☆	☆	☆	T-57S01
38-7, 38-8.....	T-13R12	☆	☆	☆	☆	T-57S01
38-9, 38-10.....	T-13R12	☆	☆	☆	☆	T-57S01
38-15.....	T-13R11	☆	☆	☆	☆	T-57S01
38-22, 38-23.....	☆	T-14C63	☆	☆	☆	T-33A91
39-55.....	T-13R14	☆	☆	☆	☆	T-57S01
39-116.....	T-13R15	☆	☆	☆	☆	T-57S01
39-117.....	T-13R11*	☆	☆	☆	☆	T-57S01
39-119.....	T-13R19*	☆	☆	☆	☆	T-57S01
39-770.....	T-13R15	☆	☆	☆	☆	T-57S01
40-130, 40-135.....	T-13R20*	☆	☆	☆	☆	T-57S01
40-140, 40-145.....	T-13R20*	☆	☆	☆	☆	T-57S01
40-165.....	T-13R11*	☆	☆	☆	☆	T-57S01
40-205.....	T-13R15	☆	☆	☆	☆	T-57S01
40-216.....	T-13R15	☆	☆	☆	☆	T-57S01
40-503, 40-506.....	T-13R12*	☆	☆	☆	☆	T-57S01
40-507.....	T-13R11	☆	☆	☆	☆	T-57S01
40-510.....	T-13R14	☆	☆	☆	☆	T-57S01
40-516.....	T-13R14	☆	☆	☆	☆	T-57S01
40-525.....	T-13R12*	☆	☆	☆	☆	T-57S01
43.....	T-13R13	T-13C28	☆	☆	☆	T-33A91
47.....	☆	T-13C29	☆	☆	☆	T-33A91
49.....	☆	T-13C28	T-13C28	☆	☆	T-33A91
50, 50A.....	T-13R03	☆	☆	☆	☆	T-57S01
51, 51A, 52.....	T-13R03	☆	☆	☆	☆	T-57S01
57, 58, 59.....	T-13R12	☆	☆	☆	☆	T-57S01
60.....	T-13R13	T-13C30	☆	☆	☆	T-57S01
65.....	T-13R06	T-13C29	T-74C30	☆	☆	T-57A42
66.....	T-13R13	T-13C30	☆	☆	☆	T-57S01
70, 70A.....	T-13R05	T-13C29	☆	☆	☆	T-57S01
71.....	T-13R13	T-13C28	☆	☆	☆	T-33A91
76, 77.....	T-13R06	T-13C30	☆	☆	☆	T-33A91
77A, 78.....	T-13R06	T-13C30	☆	☆	☆	T-33A91
80, 81.....	T-13R12	☆	☆	☆	☆	T-57S01
82.....	T-56R01	T-13C28	☆	T-29A99	T-33A91	T-57S01
84.....	T-13R12	☆	☆	☆	☆	T-57S01
86.....	T-56R01	T-13C28	☆	T-29A99	T-33A91	T-57S01

End your transformer troubles by using Tropex Transformers. See page 32.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
PHILCO RADIO & TELEVISION CORP. (Contd)						
87.....	T-56R03	T-13C30	T-13C28	T-29A99	T-33A91	T-57S01
89.....	T-13R13	☆	☆	☆	☆	T-57S01
90, 90A.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
91.....	T-13R15	T-13C30	☆	☆	T-81142	T-57S01
95, 96, 96A.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
97, 98.....	T-13R14	T-13C30	☆	☆	T-33A91	T-57S01
107.....	T-13R19*	☆	☆	☆	☆	T-57S01
111, 111A.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
112, 112A.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
116B.....	T-13R16	T-13C30	☆	☆	T-81D42	T-57S01
118.....	T-13R15	T-13C30	☆	☆	T-81D42	T-57S01
144.....	T-13R13	☆	☆	☆	☆	T-57S01
200X, 201.....	T-13R16	T-13C30	☆	☆	T-81D42	T-57S01
211, 211A.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
212, 212A.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
220, 220A.....	T-13R00	T-13C29	☆	☆	T-33A91	T-57S01
245.....	T-13R12	☆	☆	☆	☆	T-57S01
264, 265.....	T-13R13	☆	☆	☆	☆	T-57S01
270, 270A.....	T-13R05	T-13C29	☆	☆	☆	T-57S01
296, 296A.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
370, 470, 470A.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
503.....	T-13R14	T-13C30	☆	☆	T-17D01	T-57S01
504, 505.....	T-13R13	☆	☆	☆	☆	T-57S01
507.....	T-13R15	T-13C30	☆	☆	T-81D42	T-57S01
509.....	T-13R16	T-13C30	☆	☆	T-81D42	T-57S01
511.....	T-56R01	T-13C29	T-13C29	T-29A99	T-33A91	§Special
570.....	T-13R07	T-13C29	☆	☆	☆	T-57S01
600, 610.....	T-13R12	☆	☆	☆	☆	T-57S01
620, 625.....	T-13R13	☆	☆	☆	☆	T-57S01
630, 635.....	T-13R13	☆	☆	☆	☆	T-57S01
640.....	T-13R14	T-13C30	☆	☆	T-33A91	T-57S01
641.....	☆	T-13C28	☆	☆	T-33A91	T-57S01
645.....	T-13R14	T-13C30	☆	☆	T-33A91	T-57S01
650.....	T-13R15	T-13C30	☆	☆	T-81D42	T-57S01
651.....	☆	T-13C28	☆	☆	T-33A91	T-57S01
655, 660, 665.....	T-13R15	T-13C30	☆	☆	T-81D42	T-57S01
PILOT RADIO & TUBE						
FE6SG.....	T-13R00	T-13C29	T-13C27	T-29A99	T-33A91	T-57S01
7, 8, L8.....	T-13R03	☆	☆	☆	☆	T-57S01
10, 12, 20.....	T-13R03	☆	☆	☆	☆	T-57S01
31.....	T-13R01	☆	☆	☆	☆	T-57S01
39.....	T-13R03	☆	☆	☆	☆	T-57S01
41.....	T-13R01	☆	☆	☆	☆	T-57S01
X41.....	T-13R11	☆	☆	☆	☆	T-57S01
43.....	T-13R02	☆	☆	☆	☆	T-57S01
45.....	T-13R11	☆	☆	☆	☆	T-57S01
53, 55.....	T-13R12	☆	☆	☆	☆	T-57S01
63, X63, X65.....	T-13R12	☆	☆	☆	☆	T-57S01
81, 84.....	T-13R03	☆	☆	☆	☆	T-57S01
T-102.....	T-13R11	☆	☆	☆	☆	T-57S01
103, 105, X105.....	T-13R12	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
PILOT RADIO & TUBE (Contd)						
T-122.....	T-13R11	☆	☆	☆	☆	T-57S01
K111, Power Pack..	T-56R01	T-13C29	T-13C29	☆	☆	☆
114, 115.....	T-13R16	T-75C49	☆	☆	T-17D01	T-13S41
K122.....	T-13R00	T-13C39	T-13C27	T-29A99	T-33A91	T-57S01
K126, K128.....	T-13R06	T-13C30	T-13C28	☆	T-33A91	T-57S01
K136.....	T-13R05	T-13C29	T-13C29	T-29C27	T-33A91	T-57S01
S148.....	T-13R03	☆	☆	☆	☆	T-57S01
S155, S155A, S155B, S155F, C157, C157A, C157B, C157F	T-13R05	T-13C29	☆	☆	T-29A99	T-57S01
S162, S164.....	T-13R03	☆	☆	☆	☆	T-57S01
C165.....	T-13R03	☆	☆	☆	☆	T-57S01
183, 185.....	T-13R12	☆	☆	☆	☆	T-57S01
193, 195.....	T-13R12	☆	☆	☆	☆	T-57S01
213, 215.....	T-13R13	☆	☆	☆	☆	T-57S01
293, 295, S295.....	T-13R12	☆	☆	☆	☆	T-57S01
364, 365.....	T-13R15	☆	☆	☆	☆	T-57S01
S393, 395.....	T-13R12	☆	☆	☆	☆	T-57S01
403, 405.....	T-13R12	☆	☆	☆	☆	T-57S01
H554, H555.....	T-13R12	☆	☆	☆	☆	T-57S01
BC562, BC563.....	T-13R12	☆	☆	☆	☆	T-57S01
G576, G577.....	T-13R12	☆	☆	☆	☆	T-57S01
G584, G585.....	T-13R14	☆	☆	☆	☆	T-13S41
H664, H665.....	T-13R12	☆	☆	☆	☆	T-57S01
G752, G753.....	T-13R11	☆	☆	☆	☆	T-57S01
1010.....	T-13R03	☆	☆	☆	☆	T-57S01
T-1664, T-1764.....	T-13R11	☆	☆	☆	☆	T-57S01
T-1854.....	T-13R11	☆	☆	☆	☆	T-57S01
R. C. A. MFG. CO., INC.						
AVR-1.....	T-13R06	T-13C30	☆	☆	T-67D47	T-13S41
HF-1.....	T-13R14	☆	☆	☆	☆	T-57S01
R4.....	T-13R04	☆	☆	☆	T-29A99	T-57S01
5Q1, 5Q2.....	T-13R12	☆	☆	☆	☆	T-57S01
5Q4, 5Q5 series.....	T-13R12	☆	☆	☆	☆	T-57S01
R-5, R-5X.....	T-13R02	☆	☆	☆	☆	T-57S01
5T, 5T-1, 7S-2.....	T-13R12	☆	☆	☆	☆	T-57S01
5T-4, 5T-5, 5T-6.....	T-13R12	☆	☆	☆	☆	T-57S01
5T-7, 5T-8, 5U.....	T-13R12	☆	☆	☆	☆	T-57S01
C6-2, C6-12.....	T-13R12	☆	☆	☆	☆	T-57S01
6K, 6K-2, 6K-3.....	T-13R12	☆	☆	☆	☆	T-57S01
6Q1, 6Q4.....	T-13R13	☆	☆	☆	☆	T-57S01
6Q8.....	T-13R12	☆	☆	☆	☆	T-57S01
R6.....	T-13R04	☆	☆	☆	T-29A99	T-57S01
6T, T6-1, 6T-2.....	T-13R12	☆	☆	☆	☆	T-57S01
6T5, T6-9, T6-11.....	T-13R12	☆	☆	☆	☆	T-57S01
C7-6, C7-14.....	T-13R12	☆	☆	☆	☆	T-57S01
D7-7, 7K, 7K1.....	T-13R12	☆	☆	☆	☆	T-57S01
R7A.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
R7DC.....	☆	T-13C29	☆	☆	T-33A91	T-57S01
7T, 7T1, 7T5.....	T-13R12	☆	☆	☆	☆	T-57S01
7-11, 7-26.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
T7-12, 7U, 7U2.....	T-13R12	☆	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99. *Disregard 5V winding.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
R. C. A. MFG. CO., INC. (Contd)						
C8-15, C8-17.....	T-13R12	☆	☆	☆	☆	T-57S01
C8-19, C8-20.....	T-13R12	☆	☆	☆	☆	T-57S01
D8-28, 8K.....	T-13R12	☆	☆	☆	☆	T-57S01
8K11.....	T-13R13	☆	☆	☆	☆	T-57S01
8Q2, 8Q5C, 8Q5M.....	T-13R13	☆	☆	☆	☆	T-57S01
8Q4.....	T-13R13	☆	☆	☆	☆	T-57S01
8T.....	T-13R12	☆	☆	☆	☆	T-57S01
8T2, 8T11.....	T-13R13	☆	☆	☆	☆	T-57S01
T8-14, T8-16.....	T-13R12	☆	☆	☆	☆	T-57S01
8U, 8U2.....	T-13R13	☆	☆	☆	☆	T-57S01
C9-4, C9-6.....	T-13R12	☆	☆	☆	☆	T-57S01
CRD 9.....	T-13R06	T-13C30	☆	☆	T-33A91	T-13S41
D9-19.....	T-13R12	☆	☆	☆	☆	T-57S01
9K1.....	T-13R13	☆	☆	☆	☆	T-57S01
9K2.....	T-13R12	☆	☆	☆	☆	T-57S01
9K3.....	T-13R14	☆	☆	☆	☆	T-13S42
9Q4.....	T-13R14	☆	☆	☆	☆	T-57S01
9T.....	T-13R14	☆	☆	☆	☆	T-57S01
T9-9, T9-10.....	T-13R12	☆	☆	☆	☆	T-57S01
9 tube AW.....	T-13R06	T-13C28	☆	☆	T-67D47	T-57S01
R9DC.....	☆	T-13C29	☆	☆	T-33A91	T-57S01
9U, 9U2.....	T-13R14	☆	☆	☆	☆	T-13S42
10K.....	T-13R14	T-13C30	☆	☆	☆	T-13S42
10K1.....	T-13R14	☆	☆	☆	☆	T-13S42
10T.....	T-13R14	T-13C30	☆	☆	☆	T-13S42
T10-1, T10-3.....	T-13R14	☆	☆	☆	T-81D52	T-57S01
U10.....	T-13R12	☆	☆	☆	☆	T-57S01
U12, U20.....	T-13R12	☆	☆	☆	☆	T-57S01
D11-12.....	T-13R15	☆	☆	T-57A41	T-74D32	T-13S41
R11.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
C13-2.....	T-13R15	☆	☆	T-57A41	T-74D32	T-13S41
C15-3.....	T-13R15	☆	☆	T-57A41	T-74D32	T-13S41
15U.....	T-13R09	T-67C49	☆	☆	T-33A91	T-57S01
16K, 16T3.....	T-13R12	☆	☆	☆	☆	T-57S01
16T2.....	T-13R13	☆	☆	☆	☆	T-57S01
16T4.....	T-13R12	☆	☆	☆	☆	T-57S01
RE 16A.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
17K, 18T.....	T-13R13	☆	☆	☆	☆	T-57S01
R17.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
Radiola 17.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	§Special
Radiola 18DC.....	☆	T-13C28	§Special	T-29A99	T-29A99	§Special
R18.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
RE-18.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
19K.....	T-13R13	☆	☆	☆	☆	T-57S01
R-19.....	T-13R04	☆	☆	☆	T-29A99	T-57S01
Q20.....	T-13R11	☆	☆	☆	☆	T-57S01
RE-20.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
D-22.....	T-13R13	T-68C08	☆	T-52C98	T-57A41	§Special
PK23A1 Amp.....	T-13R01	T-13C27	T-13C27	☆	☆	☆
R23.....	T-13R04	☆	☆	☆	T-29A99	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
R. C. A. MFG. CO., INC. (Contd)						
TB-28-M1.....	T-13R06	☆	☆	☆	T-57A41	T-13S41
25-DC.....	☆	T-13C28	☆	☆	T-33A91	T-57S01
U25, U26.....	T-13R12	☆	☆	☆	☆	T-57S01
A-28-P.....	T-13R02	☆	☆	☆	☆	☆
R-28.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
R-28-P.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
R-32.....	T-56R03	T-13C30	☆	T-29A99	T-33A91	T-57S01
33AC.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
R-35.....	T-13R06	T-13C29	☆	☆	T-33A91	T-57S01
R-37.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
R-37-P.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
R-38, R-38-P.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
R-39.....	T-13R06	T-13C29	☆	☆	T-33A91	T-57S01
RE-40, RE-40-P...	T-13R03	T-13C28	☆	☆	☆	T-57S01
42, R-43.....	T-13R07	T-13C30	☆	☆	T-29A99	T-57S01
U42.....	T-13R12	☆	☆	☆	☆	T-57S01
U43.....	T-13R12	☆	☆	☆	☆	T-57S01
U44, U45.....	T-13R13	☆	☆	☆	☆	T-57S01
44.....	T-13R06	T-13C29	T-13C28	☆	☆	T-18C92
RE-45.....	T-56R03	T-13C30	☆	T-29A99	T-33A91	T-57S01
46.....	T-13R06	T-13C29	T-13C28	☆	☆	T-18C92
47.....	T-13R06	T-13C29	T-13C28	☆	☆	T-57S01
48.....	T-13R07	T-13C30	☆	☆	T-29A99	T-57S01
R50.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
K50, T55, T56....	T-13R12	☆	☆	☆	☆	T-57S01
RE52.....	T-56R03	T-13C30	☆	T-29A99	T-33A91	T-57S01
R55.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
RE57.....	T-13R06	T-13C29	☆	☆	T-33A91	T-57S01
K60, K62.....	T-13R12	☆	☆	☆	☆	T-57S01
T60, T62.....	T-13R12	☆	☆	☆	☆	T-57S01
K61.....	T-13R12	☆	☆	☆	☆	T-57S01
Radiola-62.....	T-13R00	T-13C29	T-13C29	☆	T-29A99	T-57S01 T-18C92
PG63.....	T-13R04	T-13C30	☆	☆	T-67D47	T-13S41
T63, T64, T65....	T-13R12	☆	☆	☆	☆	T-57S01
66.....	T-13R07	T-13C30	☆	☆	§Special	T-57S01
R70.....	T-13R03	T-13C29	☆	☆	T-29A99	T-57S01
R71, R72.....	T-13R05	T-13C29	☆	☆	T-29A99	T-57S01
R73.....	T-13R06	T-13C29	☆	☆	T-33A91	T-57S01
R73A.....	T-13R04	☆	☆	☆	T-29A99	T-57S01
R75.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
RAE-79.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
K80, K81, K82....	T-13R12	☆	☆	☆	☆	T-57S01
T80.....	T-13R12	☆	☆	☆	☆	T-57S01
Radiola 80.....	T-13R04	§Special	☆	☆	T-57A42	T-57S01
RE80.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
82.....	T-13R04	§Special	☆	☆	T-57A42	T-57S01
84BT6.....	T-14R39	T-14C63	☆	☆	☆	T-57S01
85E.....	T-13R12	☆	☆	☆	☆	T-57S01
85T.....	T-13R19	☆	☆	☆	☆	T-57S01
85T1, 85T5.....	T-13R12	☆	☆	☆	☆	T-57S01

Interested in building amateur radio receivers or transmitters? Full instructions and diagrams in Thordarson Transmitter Guide No. 344, post-paid 15 cents.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
R. C. A. MFG. CO., INC. (Contd)						
86.....	T-13R04	§Special	☆	☆	T-57A42	T-57S01
86E, 86K.....	T-13R12	☆	☆	☆	☆	T-57S01
86K7.....	T-13R12	☆	☆	☆	☆	T-57S01
86T, 86T-1.....	T-13R12	☆	☆	☆	☆	T-57S01
86T-3, 86T-4.....	T-13R12	☆	☆	☆	☆	T-57S01
86T6, 86T4.....	T-13R12	☆	☆	☆	☆	T-57S01
87K1, 87T.....	T-13R12	☆	☆	☆	☆	T-57S01
87T1, 88K.....	T-13R12	☆	☆	☆	☆	T-57S01
R90.....	T-13R04	T-18C92	☆	☆	T-57A42 T-29C27	T-57S01
R90P.....	T-13R06	T-13C27	☆	T-29C27	T-33A91	T-57S01
94BT6.....	T-14R39	T-14C63	☆	☆	☆	T-57S01
95T.....	T-13R11	T-13C30	☆	☆	T-81D52	T-13S41
95T5.....	T-13R19	☆	☆	☆	☆	T-57S01
95T5LW.....	T-13R19	☆	☆	☆	☆	T-57S01
96E, 96K.....	T-13R12	☆	☆	☆	☆	T-57S01
96K2, R96.....	T-13R12	☆	☆	☆	☆	T-57S01
96T, 96T1.....	T-13R12	☆	☆	☆	☆	T-57S01
96T2, 96T3.....	T-13R12	☆	☆	☆	☆	T-57S01
97E, 97KC.....	T-13R12	☆	☆	☆	☆	T-57S01
R97, 97T.....	T-13R12	☆	☆	☆	☆	T-57S01
R99.....	T-13R09	T-13C30	☆	☆	T-81D52	T-13S41
U101, U102E.....	T-13R12	☆	☆	☆	☆	T-57S01
U103.....	T-13R12	☆	☆	☆	☆	T-57S01
K105.....	T-13R15	☆	☆	☆	☆	T-57S01
U105, U106.....	T-13R14	☆	☆	☆	☆	T-57S01
U107.....	T-13R14	☆	☆	☆	☆	T-57S01
U109.....	T-13R16	T-67C49	☆	☆	T-81D52	T-13S41
RCA 110, 111.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
ACR111.....	T-13R12	☆	☆	☆	☆	T-57S01
U111.....	T-13R11	☆	☆	☆	☆	T-57S01
115.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
117, 118.....	T-13R12	☆	☆	☆	☆	T-57S01
U119.....	T-13R12	☆	☆	☆	☆	T-57S01
120.....	T-13R04	T-13C28	☆	☆	☆	T-57S01
121.....	T-13R05	☆	☆	☆	☆	T-57S01
122.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
U122E.....	T-13R12	☆	☆	☆	☆	T-57S01
124.....	T-13R04	☆	☆	☆	☆	T-57S01
U124, 128E.....	T-13R12	☆	☆	☆	☆	T-57S01
ARC 136.....	T-13R12	☆	☆	☆	☆	T-57S01
140, 141.....	T-13R06	T-13C30	☆	☆	T-67D47	T-13S41
141E.....	T-13R06	T-13C30	☆	☆	T-67D47	T-13S41
143.....	T-13R15	☆	☆	☆	T-33A91	T-57S01
ACR 175.....	T-13R14	☆	☆	☆	☆	T-57S01
210.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
211.....	T-13R12	☆	☆	☆	☆	T-57S01
214.....	T-13R12	☆	☆	☆	☆	T-57S01
221.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
220, 222.....	T-13R12	☆	☆	☆	☆	T-57S01
224, 224E.....	T-13R12	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
R. C. A. MFG. CO., INC. (Contd)						
240.....	T-13R06	T-13C30	☆	☆	T-67D47	T-13S41
242, 243.....	T-13R15	☆	☆	☆	T-33A91	T-57S01
260, 261.....	T-13R06	T-13C27	☆	T-29C27	T-33A91	T-57S01
262, 263.....	T-13R15	☆	☆	T-57A41	T-74D32	T-13S41
281.....	T-13R15	☆	☆	T-57A41	T-74D32	T-13S41
310.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
DUO 320, 321.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
322 DUO.....	T-13R12	☆	☆	☆	☆	T-57S01
330, 331.....	T-13R06	T-13C30	☆	☆	T-67D47	T-13S41
332E DUO.....	T-13R12	☆	☆	☆	☆	T-57S01
340 DUO, 340E.....	T-13R06	T-13C30	☆	☆	T-67D47	T-13S41
341.....	T-13R15	☆	☆	☆	T-33A91	T-57S01
381 DUO.....	T-13R15	☆	☆	T-57A41	T-74D32	T-13S41
810K, 810K1.....	T-13R14	☆	☆	☆	☆	T-57S01
810T, 810T4.....	T-13R14	☆	☆	☆	☆	T-57S01
813K.....	§Special	T-13C30	☆	☆	T-17D01	T-57S01
SEARS ROEBUCK & CO.						
FF, J.....	T-56R01	T-13C28	☆	T-29A99	T-29A99	☆
49-50.....	T-56R01	T-13C28	☆	T-29A99	T-29A99	☆
52, 53, 54.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	§Special
56.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
92, 93.....	T-56R01	T-13C28	☆	T-29A99	T-29A99	☆
94, 95, 99, 100.....	T-13R04	T-13C30	☆	T-29A99	T-33A91	§Special
108.....	T-56R01	T-47C07	☆	T-29A99	T-33A91	§Special
109.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
110, 111, 112, 114.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
388, 388X.....	T-13R14	T-13C30	☆	☆	§Special	T-57S01
709, 719 (International).....	T-13R14	☆	☆	☆	§Special	T-57S01
802, 812.....	T-13R15	☆	☆	☆	T-17D01	T-13S41
1130, 1132.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
1150.....	T-13R06	☆	☆	☆	§Special	T-57S01
1152.....	T-13R04	☆	☆	☆	☆	§Special
1170.....	T-13R06	☆	☆	☆	☆	§Special
1174.....	T-13R04	☆	☆	☆	☆	§Special
1250, 1252.....	T-13R01	☆	☆	☆	☆	T-57S01
1260 early.....	T-13R06	☆	☆	☆	§Special	T-57S01
1260 late.....	T-13R04	☆	☆	☆	☆	§Special
1280, 1282.....	T-13R03	T-13C29	T-13C29	☆	☆	T-57S01
1310, 1311, 1312.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
1320, J322, 1324 1326.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
1370.....	T-13R01	☆	☆	☆	☆	T-57S01
1390, 1400, 1402.....	T-13R05	☆	☆	☆	☆	T-57S01
1404, 1406.....	T-13R05	☆	☆	☆	☆	T-57S01
1420.....	T-13R04	☆	☆	☆	☆	T-57S01
1430.....	T-13R05	☆	☆	☆	☆	T-57S01
1506.....	T-13R03	T-13C28	T-13C28	☆	☆	T-57S01
1580, 1582, 1584.....	T-13R05	☆	☆	☆	☆	T-57S01
1590, 1592.....	T-13R02	☆	☆	☆	☆	T-57S01
1597, 1598.....	T-13R11	☆	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
SEARS ROEBUCK & CO. (Contd)						
1600 Converter.....	T-13R01	T-74C30	☆	☆	☆	☆
1660.....	T-13R11	☆	☆	☆	☆	T-57S01
1708.....	T-13R08	☆	☆	☆	☆	T-57S01
1708A.....	T-13R12	☆	☆	☆	☆	T-57S01
1709.....	T-13R08	☆	☆	☆	☆	T-57S01
1720.....	T-13R09	☆	☆	☆	☆	T-13S41
1721, 1722, 1722X..	T-13R09	☆	☆	☆	☆	T-13S41
1725.....	T-13R09	☆	☆	☆	☆	T-13S41
1726.....	T-13R09	☆	☆	☆	T-67A91	T-67S54 T-57S01
1729.....	T-13R12	☆	☆	☆	☆	T-57S01
1731.....	T-13R02	☆	☆	☆	☆	T-57S01
1732X.....	T-13R09	☆	☆	☆	T-67A91	T-67S54 T-57S01
1743, 1743A.....	T-13R02	☆	☆	☆	☆	T-57S01
1760.....	T-13R12	☆	☆	☆	☆	T-57S01
1800.....	T-13R01	☆	☆	☆	☆	T-57S01
1802, 1803, 1803A..	T-13R02	☆	☆	☆	☆	T-57S01
1804, 1805.....	T-13R08	☆	☆	☆	☆	T-57S01
1805A.....	T-13R03	☆	☆	☆	☆	T-57S01
1806.....	T-13R08	☆	☆	☆	☆	T-57S01
1807.....	T-13R02	☆	☆	☆	☆	T-57S01
1808A.....	T-13R03	☆	☆	☆	☆	T-57S01
1809.....	T-13R03	☆	☆	☆	☆	T-57S01
1811.....	T-13R03	☆	☆	☆	☆	T-57S01
1820.....	T-13R08	☆	☆	☆	☆	T-57S01
1821.....	T-13R09	☆	☆	☆	☆	T-13S41
1823.....	T-13R08	☆	☆	☆	☆	T-57S01
1826.....	T-13R08	☆	☆	☆	☆	T-57S01
1826A.....	T-13R03	☆	☆	☆	☆	T-57S01
1827.....	T-13R09	☆	☆	☆	☆	T-13S41
1829.....	T-13R08	☆	☆	☆	☆	T-57S01
1832, 1832A.....	T-13R09	☆	☆	☆	T-67A91	T-67S54 T-57S01
1833, 1835.....	T-13R03	☆	☆	☆	☆	T-57S01
1840.....	T-13R04	☆	☆	☆	☆	§Special
1841, 1845.....	T-13R03	☆	☆	☆	☆	T-57S01
1900.....	T-13R13	☆	☆	☆	☆	T-57S01
1904, 1904A.....	T-13R12	☆	☆	☆	☆	T-57S01
1905.....	T-13R14	☆	☆	☆	☆	T-57S01
1906.....	T-13R12	☆	☆	☆	☆	T-57S01
1909.....	T-13R14	☆	☆	☆	☆	T-57S01
1912.....	T-13R14	☆	☆	☆	☆	T-57S01
1914.....	T-13R12	☆	☆	☆	☆	T-57S01
1915, 1917.....	T-13R14	☆	☆	☆	☆	T-57S01
1918, 1918A.....	T-13R09	☆	T-47C07	☆	☆	T-57S01
1930, 1940.....	T-13R12	☆	☆	☆	☆	T-57S01
1941.....	T-13R14	T-13C30	☆	☆	§Special	T-57S01
1942, 1944, 1945....	T-13R14	☆	☆	☆	☆	T-57S01
1946.....	T-13R14	T-13C30	☆	☆	§Special	T-57S01
1954, 1954X.....	T-13R12	☆	☆	☆	☆	T-57S01
1955.....	T-13R14	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
SEARS ROEBUCK & CO. (Contd)						
1956.....	T-13R12	☆	☆	☆	☆	T-57S01
1962.....	T-13R14	☆	☆	☆	☆	T-57S01
1964, 1964A.....	T-13R12	☆	☆	☆	☆	T-57S01
1965.....	T-13R14	☆	☆	☆	☆	T-57S01
1967, 1967A.....	T-13R14	☆	☆	☆	☆	T-57S01
1968, 1968A.....	T-13R09	☆	T-47C07	☆	☆	T-57S01
1970A.....	T-13R12	☆	☆	☆	☆	T-57S01
1972.....	T-13R14	☆	☆	☆	☆	T-57S01
1981, 1981C.....	T-13R14	T-13C30	☆	☆	§Special	T-57S01
1986, 1987.....	T-13R12	☆	☆	☆	☆	T-57S01
1988.....	T-13R11	☆	☆	☆	☆	T-57S01
1994, 1998.....	T-13R14	☆	☆	☆	☆	T-57S01
3972.....	T-13R20	☆	☆	☆	☆	T-57S01
4401, 4402.....	T-13R11	☆	☆	☆	☆	T-57S01
4403.....	T-13R12	☆	☆	☆	☆	T-57S01
4405A.....	T-14R39	☆	☆	☆	☆	T-57S01
4428A.....	T-14R39	☆	☆	☆	☆	T-57S01
4431, 4432.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4433.....	T-14R39	☆	☆	☆	☆	T-57S01
R4433.....	T-56R01	T-47C07	☆	T-29A99	T-33A91	§Special
4435, 4436.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4448A.....	T-14R39	☆	☆	☆	☆	T-57S01
4453.....	T-14R39	☆	☆	☆	☆	T-57S01
4461, 4462.....	T-13R11	☆	☆	☆	☆	T-57S01
4463, 4464.....	T-13R12	☆	☆	☆	☆	T-57S01
4465.....	T-13R13	☆	☆	☆	☆	T-57S01
4466, 4467.....	T-13R11	☆	☆	☆	☆	T-57S01
4469.....	T-13R11	☆	☆	☆	☆	T-57S01
4472, 4473.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4484, 4485.....	T-13R20	☆	☆	☆	☆	T-57S01
4486, 4488.....	T-13R14	☆	☆	☆	☆	T-57S01
4488A.....	T-13R14	☆	☆	☆	☆	T-57S01
4488B.....	T-13R15	☆	☆	☆	☆	T-57S01
4528A.....	T-14R39	☆	☆	☆	☆	T-57S01
4531, 4533.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4548A.....	T-14R39	☆	☆	☆	☆	T-57S01
4563.....	T-13R12	☆	☆	☆	☆	T-57S01
4564, 4565 (Dup.)..	T-13R20	☆	☆	☆	☆	T-57S01
4566, 4567.....	T-13R11	☆	☆	☆	☆	T-57S01
4569.....	T-13R13	☆	☆	☆	☆	T-13S42
4586, 4586A.....	T-13R14	☆	☆	☆	☆	T-57S01
4587, 4588.....	T-13R14	☆	☆	☆	☆	T-57S01
4588A.....	T-13R14	☆	☆	☆	☆	T-57S01
4589.....	T-13R13	☆	☆	☆	☆	T-57S01
4610.....	T-13R13	☆	☆	☆	☆	T-13S42
4613.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4622, 4623.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4640.....	T-14R39	☆	☆	☆	T-78D46	T-81S01
4643.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4650.....	T-14R39	☆	☆	☆	T-78D46	T-81S01
4664.....	T-13R11	☆	☆	☆	☆	T-13S42

Prices and dimensions for all transformers and chokes shown herein listed on page 3.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
SEARS ROEBUCK & CO. (Contd)						
4667.....	T-13R14	☆	☆	☆	☆	T-13S42
4668.....	T-13R12	☆	☆	☆	☆	T-57S01
4469.....	T-13R13	☆	☆	☆	☆	T-13S43
4677.....	T-13R14	☆	☆	☆	☆	T-13S42
4684.....	T-13R11	☆	☆	☆	☆	T-13S42
4688.....	T-13R15	☆	☆	☆	T-17D01	T-13S41
4722, 4723.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4740.....	T-14R39	☆	☆	☆	T-78D46	T-81S01
4743.....	T-14R39	T-14C62	☆	☆	☆	T-13S43
4750.....	T-14R39	☆	☆	☆	T-78D46	T-81S01
4764.....	T-13R11	☆	☆	☆	☆	T-13S42
4769.....	T-13R13	☆	☆	☆	☆	T-13S42
4776.....	T-13R12	☆	☆	☆	☆	T-57S01
4784.....	T-13R11	☆	☆	☆	☆	T-13S42
4788.....	T-13R15	☆	☆	☆	T-17D01	T-13S41
4789.....	T-13R13	☆	☆	☆	☆	T-13S43
4796.....	T-13R12	☆	☆	☆	☆	T-57S01
4799.....	T-13R15	☆	☆	☆	☆	T-13S41
5710, 5711.....	T-13R20	☆	☆	☆	☆	T-57S01
6002.....	T-13R19	☆	☆	☆	☆	T-57S01
6003, 6004.....	T-13R13	☆	☆	☆	☆	T-13S41
6021.....	T-13R19	☆	☆	☆	☆	T-57S01
6024.....	T-13R13	☆	☆	☆	☆	T-13S41
6028.....	T-13R12	☆	☆	☆	☆	T-57S01
6031.....	T-13R19	☆	☆	☆	☆	T-57S01
6034.....	T-13R13	☆	☆	☆	☆	T-13S42
6036.....	T-13R14	☆	☆	☆	☆	T-13S41
6038.....	T-13R16	☆	☆	☆	☆	T-13S41
6121.....	T-13R19	☆	☆	☆	☆	T-57S01
6124.....	T-13R13	☆	☆	☆	☆	T-13S42
6131.....	T-13R19	☆	☆	☆	☆	T-57S01
6136.....	T-13R14	☆	☆	☆	☆	T-13S41
6138.....	T-13R16	☆	☆	☆	☆	T-13S41
6140.....	T-13R14	☆	☆	☆	☆	T-13S41
6155, 6156, 6254....	T-13R14	☆	☆	☆	☆	T-13S41
6157.....	T-13R15	☆	☆	☆	☆	T-13S41
6337, 6437.....	T-13R14	☆	☆	☆	☆	T-13S41
7043, 7044.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
7049.....	T-13R03	☆	☆	☆	☆	T-57S01
7050.....	T-13R11	☆	☆	☆	☆	T-57S01
7065.....	T-13R09	☆	☆	☆	T-67A91	T-13S41
7121.....	T-13R01	☆	☆	☆	☆	T-57S01
7124.....	T-13R03	☆	☆	☆	☆	T-57S01
7136, 7137.....	T-13R02	☆	☆	☆	☆	T-57S01
7140.....	T-13R02	☆	☆	☆	☆	T-57S01
7143.....	T-13R04	☆	☆	☆	☆	T-57S01
7144, 7150.....	T-13R12	☆	☆	☆	☆	T-57S01
7153.....	T-13R01	☆	☆	☆	☆	§Special
7154, 7155.....	T-13R12	☆	☆	☆	☆	T-57S01
7158.....	T-13R12	☆	☆	☆	☆	T-57S01
7170, 7170A.....	T-13R13	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
SEARS ROEBUCK & CO. (Contd)						
7171.....	T-13R20	☆	☆	☆	☆	T-57S01
7172.....	T-13R12	☆	☆	☆	☆	T-57S01
7181, 7182.....	T-13R12	☆	☆	☆	☆	T-57S01
7221.....	T-13R15	☆	☆	☆	☆	T-57S01
7230.....	T-13R12	☆	☆	☆	☆	T-57S01
7234.....	T-13R12	☆	☆	☆	☆	T-57S01
7807.....	T-13R11	☆	☆	☆	☆	T-57S01
SENTINEL RADIO CORP. (See also Ecla)						
6A.....	T-13R13	☆	☆	☆	☆	T-57S01
8, 9, 11, 12.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
14, 14A.....	T-13R14	☆	☆	☆	☆	T-57S01
15, 16.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
19A.....	T-13R13	☆	☆	☆	☆	T-57S01
20A.....	T-13R12	☆	☆	☆	☆	T-57S01
30A.....	T-13R11	☆	☆	☆	☆	T-57S01
40B, 44A.....	T-13R12	☆	☆	☆	☆	T-57S01
46A.....	T-13R13	☆	☆	☆	☆	T-57S01
47A.....	T-13R15	☆	☆	☆	T-17D01	T-13S41
48A.....	T-13R11	☆	☆	☆	☆	T-57S01
52A.....	T-13R11	☆	☆	☆	☆	T-57S01
53A.....	T-13R14	☆	☆	☆	☆	T-57S01
54A.....	T-13R11	☆	☆	☆	☆	T-57S01
70A.....	T-13R11	☆	☆	☆	☆	T-57S01
72A, 72AE.....	T-13R12	☆	☆	☆	☆	T-57S01
74A, 74AE.....	T-13R12	☆	☆	☆	☆	T-57S01
76A.....	T-13R14	☆	☆	☆	☆	T-57S01
82A, 82AE.....	T-13R12	☆	☆	☆	☆	T-57S01
92AE, 98AE.....	T-13R11	☆	☆	☆	☆	T-57S01
99AE.....	T-13R14	☆	☆	☆	☆	T-13S41
103A.....	T-13R05	T-13C30	☆	☆	T-33A91	T-57S01
104.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
106A.....	T-13R19	☆	☆	☆	☆	T-57S01
106B.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
108, 108A.....	T-13R04	T-13C29	T-13C29	☆	☆	T-57S01
109, 110.....	T-13R04	T-13C29	T-13C29	☆	☆	T-57S01
110A.....	T-13R14	☆	☆	☆	☆	T-57S01
111.....	T-13R01	☆	☆	☆	☆	T-57S01
114, 115.....	T-13R04	T-13C30	☆	☆	☆	T-57S01
116.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
118.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
125.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
125AE.....	T-13R20	☆	☆	☆	☆	T-57S01
138AE.....	T-13R20	☆	☆	☆	☆	T-57S01
141AE.....	T-13R20	☆	☆	☆	☆	T-57S01
142A.....	T-13R20	☆	☆	☆	☆	T-57S01
142AE.....	T-13R20	☆	☆	☆	☆	T-57S01
145AE.....	T-13R15	☆	☆	☆	☆	T-57S01
148A.....	T-13R19	☆	☆	☆	☆	T-57S01
149A, 149AE, 159AE	T-13R19	☆	☆	☆	☆	T-57S01
158AE.....	T-13R20	☆	☆	☆	☆	T-57S01
185A.....	T-13R11	☆	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
SENTINEL RADIO CORP. (Contd)						
198A, 198AE.....	T-13R14	☆	☆	☆	☆	T-57S01
199A, 199AE.....	T-13R14	☆	☆	☆	☆	T-57S01
206A.....	T-13R20	☆	☆	☆	☆	T-57S01
440, 444.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
513.....	T-13R02	☆	☆	☆	☆	T-57S01
622, 623.....	T-13R03	☆	☆	☆	☆	T-57S01
634, 635.....	T-13R03	☆	☆	☆	☆	T-57S01
660AC, 666, 666C..	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
4500.....	T-13R11	☆	☆	☆	☆	T-57S01
5700, 5700B.....	T-13R03	☆	☆	☆	☆	T-57S01
5721.....	T-13R03	☆	☆	☆	☆	T-57S01
5800.....	T-13R02	☆	☆	☆	☆	T-57S01
6315, 6317.....	T-13R03	☆	☆	☆	☆	T-57S01
6321.....	T-13R03	☆	☆	☆	☆	T-57S01
7100, 7100B.....	T-13R13	☆	☆	☆	☆	T-57S01
7200.....	T-13R12	☆	☆	☆	☆	T-57S01
7200B.....	T-13R13	☆	☆	☆	☆	T-57S01
8100B.....	T-13R13	☆	☆	☆	☆	T-57S01
8200B.....	T-13R14	T-13C30	☆	☆	☆	T-57S01
SILVER-MARSHALL, INC.						
A.....	T-13R04	☆	☆	☆	☆	T-57S01
A31.....	T-13R12	☆	☆	☆	☆	T-57S01
B.....	T-13R03	☆	☆	☆	T-33A91	T-57S01
C, CW (AVC).....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
D, E, F.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
G.....	T-13R06	T-13C29	T-74C30	T-29A99	T-33A91	T-57S01
J.....	T-13R06	T-13C28	☆	☆	T-33A91	T-57S01
Q, R.....	T-13R04	☆	☆	☆	☆	T-57S01
Z deluxe, Z10.....	T-13R07	T-13C30	☆	☆	T-81D52	T-57S01
Z13.....	T-13R07	T-13C30	☆	☆	T-67D78	T-13S41
30 series, 30B.....	T-13R06	T-13C28	☆	☆	T-33A91	T-57S01
33A, 34A, 35A.....	T-13R05	T-13C30	☆	☆	T-33A91	T-57S01
36A, 37.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
38, 39.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
60B, 75, 75B, 90B..	T-13R06	T-13C28	☆	☆	T-33A91	T-57S01
683.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
SM684.....	T-13R04	T-13C30	T-13C30	☆	T-33A91	T-57S01
716.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
722AC.....	T-13R05	T-13C30	☆	☆	T-33A91	T-57S01
724.....	T-13R06	T-13C28	☆	☆	T-33A91	T-57S01
726.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
727SW.....	T-13R04	☆	☆	☆	☆	T-57S01
729SW.....	T-13R07	T-13C30	☆	☆	T-81D52	T-57S01
737.....	T-13R02	T-13C28	T-13C28	☆	☆	§Special
773, 782.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
SONORA ELEC. PHONOGRAPH CO.						
A31, A33, A35.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
64.....	T-13R04	T-13C30	☆	☆	T-33A91	T-57S01
70.....	T-13R06	T-13C29	☆	☆	☆	T-57S01
74.....	T-13R03	T-13C28	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
SPARKS-WITHINGTON CO. (SPARTON)						
5, 9.....	T-13R04	☆	☆	☆	☆	T-57S01
10, 12.....	T-13R03	☆	☆	☆	☆	T-57S01
14.....	T-13R04	☆	☆	☆	☆	T-57S01
15.....	T-13R05	☆	☆	☆	☆	T-57S01
16, 16AW.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
17, 18.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
25, 26, 26AW.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
27, 27A, 27X.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
28, 28X.....	T-13R07	T-67C49	☆	☆	T-17D01	T-13S41
30, 45.....	T-13R07	T-67C49	☆	☆	T-17D01	T-13S41
46P.....	T-14R39	☆	☆	☆	☆	T-57S01
60 Super Converter.	T-13R01	T-13C26	☆	☆	☆	☆
67, 68, 68XS.....	T-13R12	☆	☆	☆	☆	T-57S01
71, 71B, 72.....	T-13R12	☆	☆	☆	☆	T-57S01
73, 73AX, 73BX...	T-13R12	☆	☆	☆	☆	T-57S01
74.....	T-13R04	T-13C30	☆	☆	T-33A91	T-57S01
75A, 75AX.....	T-13R03	☆	☆	☆	☆	T-57S01
78.....	T-13R12	☆	☆	☆	☆	T-57S01
80, 83, 84.....	T-13R13	☆	☆	☆	☆	T-57S01
85-X, 86-X.....	T-13R13	☆	☆	☆	☆	T-57S01
104, 105, 105XS...	T-13R14	☆	☆	☆	§Special	T-57S01
111X.....	T-13R07	T-13C30	☆	☆	T-33A91	T-57S01
135.....	T-13R15	☆	☆	☆	T-33A91	T-57S01
235.....	T-37R70C	T-13C29	☆	☆	T-33A91	T-57S01
417X.....	T-13R11	☆	☆	☆	☆	T-57S01
420 DC, JR Jewel...	☆	T-13C92	☆	☆	T-33A91	T-57S01
427X, 437X.....	T-13R12	☆	☆	☆	☆	T-57S01
457X.....	T-13R12	☆	☆	☆	☆	T-57S01
475A, 478A.....	T-13R03	☆	☆	☆	☆	T-57S01
516, 516X.....	T-13R12	☆	☆	☆	☆	T-57S01
517.....	T-13R12	☆	☆	☆	☆	T-57S01
518, 518X.....	T-13R12	☆	☆	☆	☆	T-57S01
530X.....	T-13R11	☆	☆	☆	☆	T-57S01
536, 536X.....	T-13R12	☆	☆	☆	☆	T-57S01
537, 538, 538X.....	T-13R12	☆	☆	☆	☆	T-57S01
5401X.....	T-13R12	☆	☆	☆	☆	T-57S01
546X, 548X.....	T-13R12	☆	☆	☆	☆	T-57S01
550M.....	T-13R20	☆	☆	☆	☆	T-57S01
557, 558B, 558C...	T-13R12	☆	☆	☆	☆	T-57S01
567, 568.....	T-13R12	☆	☆	☆	☆	T-57S01
577.....	T-13R12	☆	☆	☆	☆	T-57S01
580X.....	T-13R12	☆	☆	☆	☆	T-57S01
589.....	T-37R70C	T-13C29	☆	☆	T-33A91	T-57S01
591, 593.....	T-37R70C	T-13C29	☆	☆	T-33A91	T-57S01
616, 616M.....	T-13R12	☆	☆	☆	☆	T-57S01
616MX, 616X.....	T-13R12	☆	☆	☆	☆	T-57S01
617, 617X.....	T-13R12	☆	☆	☆	☆	T-57S01
620.....	T-37R70C	☆	☆	☆	☆	T-57S01
628, 636MX.....	T-13R12	☆	☆	☆	☆	T-57S01
6401X, 7401X.....	T-13R12	☆	☆	☆	☆	T-57S01
660M.....	T-13R20	☆	☆	☆	☆	T-57S01

For complete description of these and other Thordarson transformers and chokes see catalog No. 400.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
SPARKS-WITHINGTON CO. (Contd)						
666, 666M.....	T-13R12	☆	☆	☆	☆	T-57S01
666MX, 666X.....	T-13R12	☆	☆	☆	☆	T-57S01
667, 667X.....	T-13R12	☆	☆	☆	☆	T-57S01
668, 678.....	T-13R12	☆	☆	☆	☆	T-57S01
685, 686, 691.....	T-13R12	☆	☆	☆	☆	T-57S01
716.....	T-13R12	☆	☆	☆	☆	T-57S01
727X, 727XD.....	T-13R13	☆	☆	☆	☆	T-57S01
728X.....	T-13R20	☆	☆	☆	☆	T-57S01
737.....	T-37R70C T-13C29	☆	☆	☆	☆	T-57S01
738.....	T-13R14	☆	☆	☆	☆	T-13S42
740.....	☆ T-13C30	☆	☆	☆	☆	T-57S01
748X.....	T-13R12	☆	☆	☆	☆	T-57S01
750 all DC.....	☆ T-13C30	☆	☆	☆	☆	T-57S01
750A, 750X.....	T-13R07 T-13C30	☆	☆	☆	☆	T-57S01
760PS.....	T-13R11	☆	☆	☆	☆	T-57S01
766, 766X.....	T-13R12	☆	☆	☆	☆	T-57S01
766XP, 766XS.....	T-13R12	☆	☆	☆	☆	T-57S01
768, 768X.....	T-13R12	☆	☆	☆	☆	T-57S01
770, 880A.....	T-13R14	☆	☆	☆	☆	T-57S01
778, 778X.....	T-13R12	☆	☆	☆	☆	T-57S01
827X, 827XD.....	T-13R16	☆	☆	☆	☆	T-13S42
867.....	T-13R13	☆	☆	☆	☆	T-57S01
870A, 870X.....	T-13R07 T-13C30	☆	☆	☆	☆	T-57S01
877X.....	T-13R13	☆	☆	☆	☆	T-57S01
880.....	T-13R11	☆	☆	☆	☆	T-57S01
928X.....	T-13R14	☆	☆	☆	☆	T-13S42
930, 931.....	T-37R70C T-13C29	☆	☆	☆	☆	T-57S01
940LX, 940SX.....	T-13R14	☆	☆	☆	☆	T-57S01
966, 966X.....	T-13R14	☆	☆	☆	☆	§Special T-57S01
968, 968X.....	T-13R13	☆	☆	☆	☆	T-13S42
977.....	T-13R12	☆	☆	☆	☆	T-57S01
987, 997X.....	T-13R16	☆	☆	☆	☆	T-13S42
1068, 1068X.....	T-13R12	☆	☆	☆	☆	T-57S01
1078, 1078X.....	T-13R12	☆	☆	☆	☆	T-57S01
1089.....	T-13R14	☆	☆	☆	☆	T-13S42
1116X, 1166.....	T-13R14 T-13C30	☆	☆	☆	☆	T-57S01
1160.....	T-13R15	☆	☆	☆	☆	T-57S01
1166XP, 1166XS.....	T-13R14 T-13C30	☆	☆	☆	☆	T-57S01
1167.....	T-13R09 T-13C30 T-13C28	☆	☆	☆	☆	T-57S01
1176, 1176XP.....	T-13R14 T-13C30	☆	☆	☆	☆	T-57S01
1176XS, 1186.....	T-13R14 T-13C30	☆	☆	☆	☆	T-57S01
1196.....	T-13R14 T-13C30	☆	☆	☆	☆	T-57S01
1268, 1288P.....	T-13R09 T-13C30 T-74C30	☆	☆	☆	☆	T-57S01
1567.....	T-13R04 T-13C30 T-74C30 T-29A99	☆	☆	☆	☆	§Special T-13S41
STEINITE RADIO CO.						
8 Tube Pentode.....	T-13R03 T-13C28	☆	☆	☆	☆	T-57S01
40C, 45, 45A, 50A.....	T-56R05 T-13C29	☆	☆	☆	☆	T-29A99 T-33A91 T-57S01
60C.....	T-56R05 T-13C29	☆	☆	☆	☆	T-29A99 T-33A91 T-57S01
70, 80, 95.....	T-13R05 T-13C28	☆	☆	☆	☆	T-33A91 T-57S01
102C.....	T-56R05 T-13C29	☆	☆	☆	☆	T-29A99 T-33A91 T-57S01
102SPU.....	T-56R05 T-13C29	☆	☆	☆	☆	T-29A99 T-33A91 T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
STEINITE RADIO CO. (Contd)						
203.....	T-13R04 T-13C29	☆	☆	☆	☆	T-57A42 T-57S01
210, 230.....	T-13R05 T-13C29	☆	☆	☆	☆	T-33A91 T-57S01
261, 262, 263, 264, 265.....	T-56R01 T-13C28 T-13C28	☆	☆	☆	☆	T-29A99 T-33A91 T-57S01
420 (15).....	T-13R00	☆	☆	☆	☆	T-29A99 T-57S01
420 (17).....	T-13R06 T-13C30	☆	☆	☆	☆	T-57A42 ☆
421, 425.....	T-56R05 T-13C29	☆	☆	☆	☆	T-57A42 T-57S01
423.....	T-13R03	☆	☆	☆	☆	§Special T-57S01
450 (15).....	T-13R00	☆	☆	☆	☆	T-29A99 T-57S01
450 (17).....	T-13R06 T-13C30	☆	☆	☆	☆	T-57A42 ☆
642B.....	T-13R04 T-13C29	☆	☆	☆	☆	T-57A42 T-57S01
700, 701.....	T-13R03	☆	☆	☆	☆	§Special T-57S01
705, 706, 725.....	T-13R04 T-13C29	☆	☆	☆	☆	T-33A91 T-57S01
STEWART-WARNER CORP.						
01-5H1 to 01-5H9 (01-5H).....	T-13R20	☆	☆	☆	☆	T-57S01
01-6D, 01-6DX, 01-6A, 01-6B, 01-6AX, 01-6BX	T-13R20	☆	☆	☆	☆	T-57S01
01-6C9, 010-6C9X	T-13R20	☆	☆	☆	☆	T-57S01
01-6E1 to 01-6E9 (01-6E).....	T-13R20	☆	☆	☆	☆	T-57S01
01-8A1 to 01-8A9 (01-8A).....	T-13R12	☆	☆	☆	☆	T-13S42
01-8C7 (01-8C).....	T-13R13	☆	☆	☆	☆	T-57S01
01-9A7 (01-9A).....	T-13R13	☆	☆	☆	☆	T-57S01
01-8B1 to 01-8B9 (01-8B).....	T-13R12	☆	☆	☆	☆	T-13S42
01-521 to 01-529 (01-52).....	T-13R11	☆	☆	☆	☆	T-57S01
01-531 to 01-539 (01-53).....	T-13R11	☆	☆	☆	☆	T-57S01
01-541 to 01-549 (01-54).....	T-13R11	☆	☆	☆	☆	T-57S01
01-611 to 01-619 (01-61).....	T-13R11	☆	☆	☆	☆	T-57S01
01-811 to 01-819 (01-81).....	T-13R20	☆	☆	☆	☆	T-57S01
91-510 to 91-519 (91-51).....	T-13R19	☆	☆	☆	☆	T-57S01
91-611 to 91-619 (91-61).....	T-13R20	☆	☆	☆	☆	T-57S01
910-621 to 910-629 (91-62).....	T-13R19	☆	☆	☆	☆	T-57S01
91-641 to 91-649 (91-64).....	T-13R19	☆	☆	☆	☆	T-57S01
91-648 (91-64).....	T-13R11	☆	☆	☆	☆	T-57S01
91-711 to 91-719 (91-71).....	T-13R20	☆	☆	☆	☆	T-57S01
91-811 to 91-819 (91-81).....	T-13R14	☆	☆	☆	☆	T-57S01
91-821 to 91-829 (91-82).....	T-13R15	☆	☆	☆	☆	T-13S42
R100, A, B, E.....	T-13R06 T-13C30	☆	☆	☆	☆	T-33A91 T-57S01
R101A, R101B.....	T-13R01	☆	☆	☆	☆	T-57S01
102A, B, E.....	T-13R03 T-44C02	☆	☆	☆	☆	T-33A91 T-57S01
R104A, B, E.....	T-13R04 T-13C29	☆	☆	☆	☆	T-57S01
106.....	T-13R04 T-13C29	☆	☆	☆	☆	T-57S01
R110.....	T-13R06 T-13C30	☆	☆	☆	☆	T-33A91 T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
STEWART-WARNER CORP. (Contd)						
R116.....	T-13R12	☆	☆	☆	☆	T-57S01
R119.....	T-13R12	☆	☆	☆	☆	T-57S01
R120.....	T-56R05	☆	☆	☆	☆	T-57S01
530, 535.....	T-56R01	T-13C29	T-13C29	☆	☆	☆
715, 720, 750.....	T-56R01	T-13C29	T-13C29	☆	☆	☆
801, 802, 811.....	T-56R01	T-13C29	T-13C29	☆	☆	☆
901, 902, 903.....	T-13R06	T-13C30	T-13C30	T-29A99	T-33A91	T-57S01
911, 912, 913.....	T-13R06	T-13C30	T-13C30	T-29A99	T-33A91	T-57S01
951, 952, 953.....	T-13R06	T-13C30	T-13C30	T-29A99	T-33A91	T-57S01
1090, 1099.....	T-13R03	☆	☆	☆	☆	T-57S01
1201-1209 (R120)...	T-56R05	☆	☆	☆	☆	T-57S01
1231-1239 (R123)...	T-13R12	☆	☆	☆	☆	T-57S01
1251-1259 (R125)...	T-13R12	☆	☆	☆	☆	T-57S01
1261-1269 (R126)...	T-13R12	☆	☆	☆	☆	T-57S01
1271-1279 (R127)...	T-13R12	☆	☆	☆	☆	T-57S01
1301-1309 (R130)...	T-13R12	☆	☆	☆	☆	T-57S01
1341-1349 (R134)...	T-13R12	☆	☆	☆	☆	T-57S01
1361-1369 (R136)...	T-13R12	☆	☆	☆	☆	T-57S01
1371-1379 (R137)...	T-13R09	☆	T-47C07	☆	T-57A41	T-13S41
1381-1389 (R138)...	T-13R09	☆	T-47C07	☆	T-57A41	T-13S41
1401-1409 (R140)...	T-13R12	☆	☆	☆	☆	T-57S01
1451-1459 (R145)...	T-13R12	☆	☆	☆	☆	T-57S01
1461-1469 (R146)...	T-13R12	☆	☆	☆	☆	T-57S01
1471-1479 (R147)...	T-13R13	☆	☆	☆	☆	T-13S42
1481-1489 (R148)...	T-13R15	☆	☆	☆	T-33A91	T-13S41
1491-1499 (R149)...	T-13R15	☆	☆	☆	T-57A41	T-13S41
1631D-1639D (R163D).....	T-14R39	☆	☆	☆	T-78D46	T-81S01
1671-1679 (R167S)...	T-13R11	☆	☆	☆	☆	T-57S01
1691-1695 (R169)...	T-13R11	☆	☆	☆	☆	T-57S01
1721-1729 (R172)...	T-13R11	☆	☆	☆	☆	T-57S01
1731-1739 (R173)...	T-13R12	☆	☆	☆	☆	T-57S01
1801-1809 (R180)...	T-13R11	☆	☆	☆	☆	T-57S01
1811-1819 (R181)...	T-13R11	☆	☆	☆	☆	T-57S01
1821-1829 (R182)...	T-13R12	☆	☆	☆	☆	T-13S42
1831-1839 (R183)...	T-13R12	☆	☆	☆	☆	T-13S42
1841-1849 (R184)...	T-13R14	☆	☆	☆	☆	T-13S42
1851-1859 (R185)...	T-13R15	☆	☆	☆	☆	T-13S41
1861-1869 (R186)...	T-13R15	☆	☆	☆	☆	T-13S41
3041-3049 (R304)...	T-13R19	☆	☆	☆	☆	T-57S01
STROMBERG-CARLSON TEL. MFG. CO.						
10, 11.....	T-13R06	T-13C29	T-13C29	☆	§Special	T-57S01
19, 20.....	T-13R06	T-13C30	☆	☆	§Special	T-57S01
22, 22A.....	T-13R06	T-13C30	☆	☆	§Special	T-57S01
25, 26.....	T-13R06	T-13C29	T-13C29	☆	§Special	T-57S01
29.....	T-13R06	T-13C29	T-13C29	☆	§Special	T-57S01
37, 38, 39.....	T-13R06	☆	☆	☆	§Special	T-57S01
40, 41.....	T-13R06	☆	☆	☆	§Special	T-57S01
52, 54.....	T-13R07	T-75C51	☆	T-33A91	T-58A70	T-13S41
58-L, 58-LB, 58-T.....	T-13R12	☆	☆	☆	☆	T-57S01
58-TB, 58-W, 58-WB	T-13R12	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
STROMBERG-CARLSON TEL. MFG. CO. (Contd)						
60.....	T-13R13	T-13C30	☆	☆	T-33A91	T-57S01
61-L, 61-LB, 61-T.....	T-13R12	☆	☆	☆	☆	T-57S01
61-TB, 61-W, 61-WB	T-13R12	☆	☆	☆	☆	T-57S01
62, 63.....	T-13R15	T-13C30	☆	☆	§Special	T-57S01
64.....	T-13R15	T-13C30	☆	T-29A99	T-17D01	T-13S41
70, 72.....	T-13R08	T-67C49	☆	☆	T-67D78	T-67S92
80.....	T-13R16	T-13C30	☆	☆	§Special	T-13S41
82, 82B, 83, 83B...	T-13R15	T-13C30	☆	☆	T-17D01	T-13S41
84, 84B.....	T-13R15	T-13C30	☆	☆	T-17D01	T-13S41
130.....	T-13R12	☆	☆	☆	☆	T-57S01
140H, 140HB.....	T-13R14	T-13C30	☆	☆	☆	T-57S01
140K, 140KB.....	T-13R14	T-13C30	☆	☆	§Special	T-57S01
140-L, 140-P.....	T-13R14	T-13C30	☆	☆	§Special	T-57S01
145-L, 145-LB.....	T-13R16	T-67C49	☆	☆	§Special	T-13S42
145-P, 145-PB.....	T-13R16	T-67C49	☆	☆	§Special	T-13S42
150-L, 150-LB.....	T-13R15	T-67C49	☆	☆	§Special	T-13S41
160-L, 160-LB.....	T-13R16	T-67C49	☆	☆	T-17D01	T-13S41
180-L, 180-LB.....	T-13R16	T-67C49	☆	☆	T-17D01	T-13S41
228 series.....	T-13R12	☆	☆	☆	☆	T-57S01
229P.....	T-13R12	☆	☆	☆	☆	T-57S01
230 series, 231 series	T-13R12	☆	☆	☆	☆	T-57S01
235H, 235HB.....	T-13R12	☆	☆	☆	☆	T-57S01
235-L, 235-LB.....	T-13R12	☆	☆	☆	☆	T-57S01
240 series.....	T-13R14	☆	☆	☆	☆	T-57S01
245 series.....	T-13R15	☆	☆	☆	T-17D01	T-13S41
250-L, 250-LB.....	T-13R16	T-67C49	☆	☆	☆	T-13S41
255-L.....	T-13R16	T-13C30	☆	☆	☆	T-13S41
260 series.....	T-13R16	☆	☆	☆	§Special	T-13S41
320-H, 320-T.....	T-13R19	☆	☆	☆	☆	T-13S42
325-J, 325-M, 325-S	T-13R19	☆	☆	☆	☆	T-13S42
335-L, 336-P.....	T-13R13	☆	☆	☆	☆	T-57S01
337-H, 337-L.....	T-13R13	☆	☆	☆	☆	T-57S01
340-F, 340-H, 340-M, 340-V, 340-P.....	T-13R14	☆	☆	☆	☆	T-13S41
341-P, 341-R.....	T-13R13	☆	☆	☆	☆	T-13S41
345-F, 345-M.....	T-13R14	☆	☆	☆	☆	T-13S41
350-M, 350-P, 350-R, 350-V.....	T-13R16	T-13C30	☆	☆	☆	T-13S41
400.....	T-13R11	☆	☆	☆	☆	T-13S42
410, 411, 412, 420.....	T-13R12	☆	☆	☆	☆	T-57S01
430.....	T-13R14	☆	☆	☆	☆	T-13S42
435 (AM).....	T-13R14	☆	☆	☆	☆	T-13S42
435 (FM).....	T-13R20	☆	☆	☆	☆	T-57S01
455.....	T-13R14	☆	☆	☆	☆	T-13S41
635, 636.....	T-56R01	T-13C29	☆	T-29A99	T-29A99	T-18C92
638-AC.....	T-13R05	T-13C29	☆	T-29A99	T-29A99	T-18C92
641, 642.....	T-13R05	T-13C29	T-13C29	☆	T-29A99	T-57S01
652, 654.....	T-13R05	T-13C29	T-13C29	☆	T-29A99	T-57S01
846, 848.....	T-56R05	T-13C30	T-13C29	T-29A99	T-33A91	T-57S01
TRANSFORMER CORP. OF AMERICA (CLARION)						
TC1, TC2, TC6.....	T-13R12	☆	☆	☆	☆	T-57S01
TC20, TC21.....	T-13R02	☆	☆	☆	☆	T-57S01

Prices and dimensions for all transformers and chokes shown herein listed on page 3.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
TRANSFORMER CORP. OF AMERICA (Contd)						
TC22, TC23.....	T-13R12	☆	☆	☆	☆	T-57S01
25-220.....	T-13R03	T-13C28	T-13C28	☆	☆	T-57S01
TC39, TC39A, TC39LW.....	T-13R12	☆	☆	☆	☆	T-57S01
40.....	T-13R04	T-13C29	T-18C92	☆	§Special	T-57S01
TC40.....	T-13R02	☆	☆	☆	☆	T-57S01
TC42, TC43, TC44.	T-13R06	☆	☆	☆	T-33A91	T-57S01
51, 53.....	T-13R07	T-13C29	T-18C92	☆	T-33A91	T-57S01
TC53A.....	T-13R08	T-13C30	☆	☆	T-33A91	T-57S01
55.....	T-13R07	T-13C29	T-18C92	☆	T-33A91	T-57S01
60 Jr.....	T-13R04	T-13C29	T-18C92	☆	§Special	T-57S01
61, 70.....	T-13R04	T-13C29	T-18C92	☆	T-33A91	T-57S01
80, 84, 85.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
94.....	T-56R05	T-13C29	☆	☆	☆	T-57S01
100.....	T-13R03	T-13C28	T-13C28	☆	☆	T-57S01
160.....	§Special	T-13C30	☆	☆	T-33A91	T-57S01
220.....	T-13R03	T-13C28	T-13C28	☆	☆	T-57S01
241.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
AC-260.....	T-13R06	T-13C30	☆	☆	☆	T-57S01
AC-280.....	T-13R07	T-13C30	☆	☆	T-33A91	T-13S41
AC-320.....	T-13R02	☆	☆	☆	☆	T-57S01
340.....	T-13R04	☆	☆	☆	☆	T-57S01
470.....	T-13R02	☆	☆	☆	☆	T-57S01
480.....	T-13R06	T-13C30	☆	☆	§Special	T-67S52
490.....	T-13R06	T-13C29	☆	☆	T-67D47	T-57S01

UNITED AMERICAN BOSCH CORP. (BOSCH)						
4 Ensex.....	T-13R02	☆	☆	☆	☆	T-57S01
5A.....	T-13R03	☆	☆	☆	☆	T-57S01
10 Ensex.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
20J, 20K, 20L.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
28.....	T-56R01	T-13C28	☆	T-29A99	T-33A91	§Special
36, 37.....	T-13R03	☆	☆	☆	☆	T-57S01
40, 41AC.....	T-13R04	☆	☆	☆	☆	T-57S01
46.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
48.....	T-13R06	T-13C30	T-74C30	☆	T-33A91	T-57S01
54DC.....	☆	T-13C27	☆	☆	T-33A91	T-57S01
56 Batt.....	☆	☆	☆	T-29A99	T-33A91	T-57S01
58, 60.....	T-56R05	T-13C30	☆	☆	T-33A91	T-57S01
62DC, 63DC.....	☆	T-13C27	☆	☆	T-33A91	T-57S01
66, 96.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
107.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	§Special
116, 126, 136.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
146, 166, 176.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
200, 201.....	T-13R02	☆	☆	☆	☆	T-57S01
205, 206, 211.....	T-13R03	☆	☆	☆	☆	T-57S01
236, 237.....	T-13R03	☆	☆	☆	☆	T-57S01
242, 243.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
250, 251.....	T-56R05	T-13C30	☆	☆	T-33A91	T-57S01
260, 261.....	T-56R05	T-13C30	☆	☆	T-33A91	T-57S01
305.....	T-13R02	☆	☆	☆	☆	T-57S01
306.....	T-13R14	§Special	☆	☆	T-74A31	T-57S01

UNITED AMERICAN BOSCH CORP. (Contd)						
307.....	T-13R03	☆	☆	☆	☆	T-57S01
310A.....	T-13R06	☆	☆	☆	T-33A91	T-57S01
352.....	T-13R02	☆	☆	☆	☆	T-57S01
360.....	T-13R03	☆	☆	☆	☆	T-57S01
370.....	T-13R06	T-13C30	☆	☆	T-67D47	T-13S41
420, 421.....	T-13R01	☆	☆	☆	☆	T-57S01
430, 430J, 430T....	T-13R01	☆	☆	☆	☆	T-57S01
440C, 440T.....	T-13R12	☆	☆	☆	☆	T-57S01
450H, 450L.....	T-13R12	☆	☆	☆	☆	T-57S01
460, 460A.....	T-13R02	☆	☆	☆	☆	T-57S01
460B, 460R.....	T-13R02	☆	☆	☆	☆	T-57S01
480.....	T-13R15	T-13C30	T-13C28	☆	§Special	T-13S41
505, 510, 510E.....	T-13R12	☆	☆	☆	☆	T-57S01
515.....	T-13R19	☆	☆	☆	☆	T-57S01
565K, 565W.....	T-13R12	☆	☆	☆	☆	T-57S01
570C, 570U.....	T-13R02	☆	☆	☆	☆	T-57S01
575F, 575Q.....	T-13R12	☆	☆	☆	☆	T-57S01
585, 585Y, 585Z....	T-13R12	☆	☆	☆	☆	T-57S01
595M, 595P.....	T-13R14	☆	☆	☆	§Special	T-57S01
605, 605C.....	T-13R12	☆	☆	☆	☆	T-57S01
640, 650.....	T-13R12	☆	☆	☆	☆	T-57S01
660C, 660T.....	T-13R12	☆	☆	☆	☆	T-57S01
812.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
1350.....	T-13R02	☆	☆	☆	☆	T-57S01

UNITED MOTORS SERVICE (DELCO)						
1102, 1103, 1104....	T-13R12	☆	☆	☆	☆	T-57S01
1105, 1106, 1107....	T-13R12	☆	☆	☆	☆	T-57S01
1108.....	T-13R12	☆	☆	☆	☆	T-57S01
1109.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
1110.....	T-13R09	T-13C30	☆	☆	T-17D01	T-13S41
R1115 early-late....	T-13R11	☆	☆	☆	☆	T-57S01
R1116, R1117.....	T-13R11	☆	☆	☆	☆	T-57S01
R1118.....	T-13R13	☆	☆	☆	☆	T-57S01
R1119.....	T-13R15	☆	☆	☆	T-33A91	T-13S41
R1120.....	T-13R20	☆	☆	☆	☆	T-57S01
R1125.....	T-13R19	☆	☆	☆	☆	T-57S01
R1126, R1127.....	T-13R11	☆	☆	☆	☆	T-57S01
R1128.....	T-13R20	☆	☆	☆	☆	T-57S01
R1129.....	T-13R20	☆	☆	☆	☆	T-57S01
R1130, R1131.....	T-13R12	☆	☆	☆	☆	T-13S42
R1132.....	T-13R14	☆	☆	☆	☆	T-13S41
R1140, R1141.....	T-13R11	☆	☆	☆	☆	T-57S01
R1142.....	T-13R20	☆	☆	☆	☆	T-57S01
R1143.....	T-13R20	☆	☆	☆	☆	T-57S01
R1144.....	T-13R20	☆	☆	☆	☆	T-57S01
R1145.....	T-13R20	☆	☆	☆	☆	T-57S01
R6011, R6012.....	T-14R39	T-14C63	☆	☆	T-78D46	T-81S01
R6015.....	T-14R39	T-14C63	☆	☆	T-78D46	T-81S01
U. S. RADIO & TELEVISION CORP. (APEX)						
5A.....	T-13R02	☆	☆	☆	☆	T-57S01
7AC, 7D (700).....	T-13R05	T-13C29	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes: T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
U. S. RADIO & TELEVISION CORP. (Contd)						
8.....	T-13R05	T-13C29	☆	☆	☆	T-57S01
10, 10C (1000-1001)	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
24 (400).....	T-13R01	☆	☆	☆	☆	T-57S01
25 (500).....	T-13R02	☆	☆	☆	☆	T-57S01
26, 26P.....	T-13R03	T-13C28	☆	☆	☆	T-57S01
27, 27P.....	T-13R03	T-13C28	☆	☆	T-29A99	T-57S01
28.....	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
29, 31, 32.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
36, 37 apex.....	T-56R01	T-13C29	T-13C29	T-29A99	T-29A99	☆
41-60.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
42-60.....	T-13R06	T-13C30	T-18C92	T-29A99	T-33A91	T-57S01
43-25, 44-25.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
46, 46A.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
47, 47A.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
48, 48A.....	T-13R06	T-13C30	☆	T-29A99	T-33A91	T-57S01
80.....	T-56R01	T-13C29	☆	T-29A99	T-33A91	§Special
99, 99X.....	T-13R03	☆	☆	☆	☆	T-57S01
112A.....	T-13R01	T-13C27	☆	☆	☆	☆
160, 250 (90).....	T-13R06	T-13C29	T-74C30	T-29A99	T-33A91	T-57S01
3040, 3056 (507)....	T-13R02	☆	☆	☆	☆	T-57S01
3070 (1009).....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
WELLS-GARDNER & CO.						
C, CG.....	T-56R03	T-13C29	☆	☆	T-33A91	T-57S01
ODM.....	T-13R08	☆	☆	☆	T-33A91	T-57S01
0EL.....	T-13R14	☆	☆	☆	§Special	T-57S01
02A.....	§Special	T-13C30	☆	☆	T-81D42	T-57S01
07A.....	T-13R12	☆	☆	☆	☆	T-57S01
073DC.....	☆	T-13C29	T-13C29	☆	T-33A91	T-57S01
A1 series.....	T-13R11	☆	☆	☆	☆	T-57S01
A2 series.....	T-13R14	☆	☆	☆	☆	T-57S01
A4 series.....	T-13R11	☆	☆	☆	☆	T-57S01
A5 series, 5D series.....	T-13R12	☆	☆	☆	☆	T-57S01
5F, 5FL, 5K, 5KL.....	T-13R19	☆	☆	☆	☆	T-57S01
6C series.....	T-13R12	☆	☆	☆	☆	T-57S01
6D series, 6K.....	☆	T-13C28	☆	☆	T-67D50	T-57S01
7D series (27D1, 27D5).....	T-13R12	☆	☆	☆	☆	T-57S01
7F, 7FL.....	T-13R12	☆	☆	☆	☆	T-57S01
7GM series (37G-508, 37G-566)	T-13R12	☆	☆	☆	☆	T-57S01
7J, 7K series.....	T-13R12	☆	☆	☆	☆	T-57S01
A8 series.....	T-13R11	☆	☆	☆	☆	T-57S01
A10 series.....	T-13R19	☆	☆	☆	☆	T-57S01
A12.....	T-13R14	☆	☆	☆	☆	T-57S01
A14 series.....	T-13R11	☆	☆	☆	☆	T-57S01
A15 series.....	T-13R19	☆	☆	☆	☆	T-57S01
40.....	T-13R04	T-13C29	☆	☆	☆	T-57S01
40A.....	T-56R05	T-13C30	☆	☆	☆	T-57S01
72.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
80, 82A.....	T-13R06	T-13C29	☆	☆	T-33A91	T-57S01
502.....	T-13R06	☆	☆	☆	☆	T-57S01
572AC.....	T-56R05	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
WESTINGHOUSE ELECTRIC SUPPLY CO., INC.						
WR-4, WR-5.....	T-13R07	T-13C29	☆	☆	T-33A91	T-57S01
WR-6, WR-6-R.....	T-13R07	T-13C29	☆	☆	T-33A91	T-57S01
WR-7, WR-7-R.....	T-13R07	T-13C29	☆	☆	T-33A91	T-57S01
WR-10.....	T-13R07	☆	☆	☆	T-33A91	T-57S01
WR-10-A.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
WR-12, WR-13.....	T-13R07	☆	☆	☆	T-33A91	T-57S01
WR-14, WR-14-CR.....	T-13R04	☆	☆	☆	☆	T-57S01
WR-15.....	T-13R07	☆	☆	☆	T-33A91	T-57S01
WR-15-A, WR-16.....	T-13R07	☆	☆	☆	T-29A99	T-57S01
WR-17.....	T-13R04	☆	☆	☆	T-29A99	T-57S01
WR-18, WR-19.....	T-13R07	☆	☆	☆	T-29A99	T-57S01
WR-20.....	T-56R05	T-13C30	☆	☆	T-78D46	T-57S01
WR-21.....	T-13R05	☆	☆	☆	§Special	§Special
WR-22.....	T-13R02	☆	☆	☆	☆	T-57S01
WR-23, WR-24.....	T-13R03	☆	☆	☆	☆	T-57S01
WR-27.....	T-13R19	☆	☆	☆	☆	T-57S01
WR-28, WR-29.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-30, WR-31.....	T-13R07	T-13C30	☆	☆	§Special	T-13S41
WR-35.....	T-13R05	☆	☆	☆	☆	T-57S01
WR-36.....	T-13R04	☆	☆	☆	☆	T-57S01
WR-37.....	T-13R05	☆	☆	☆	☆	T-57S01
WR-38, WR-39.....	T-13R07	T-13C29	☆	☆	§Special	T-13S41
WR-45, WR-45-A.....	T-13R15	☆	☆	☆	T-33A91	T-57S01
WR-46, WR-46-A.....	T-13R13	☆	☆	☆	☆	T-57S01
WR-48, WR-48-A.....	T-13R13	☆	☆	☆	☆	T-57S01
WR-49, WR-50.....	T-13R13	☆	☆	☆	☆	T-57S01
WR-53.....	T-13R13	☆	☆	☆	☆	T-57S01
WR-201.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-203, WR-204.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-205, WR-208.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-209, WR-210.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-211, WR-211-A.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-211U, WR-211X.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-212, WR-212X.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-214.....	T-13R15	☆	☆	☆	☆	T-57S01
WR-222.....	T-13R19	☆	☆	☆	☆	T-57S01
WR224.....	T-13R20	☆	☆	☆	☆	T-57S01
WR-226.....	T-13R20	☆	☆	☆	☆	T-57S01
WR-228.....	T-13R14	☆	☆	☆	☆	T-57S01
WR-256.....	T-13R11	☆	☆	☆	☆	T-57S01
WR258.....	T-13R19	☆	☆	☆	☆	T-57S01
WR260.....	T-13R19	☆	☆	☆	☆	T-57S01
WR-264.....	T-13R12	☆	☆	☆	☆	T-57S01
WR270.....	T-13R11	☆	☆	☆	☆	T-57S01
WR-303, WR-304.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-305.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-306.....	T-13R14	T-67C49	☆	☆	§Special	T-13S41
WR-310, WR-311.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-311X.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-312.....	T-13R12	☆	☆	☆	☆	T-57S01



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
WESTINGHOUSE ELECTRIC SUPPLY CO., INC. (Contd)						
WR-312X.....	T-13R12	☆	☆	☆	☆	T-57S01
WR-314.....	T-13R15	☆	☆	☆	☆	T-57S01
WR-315.....	T-13R16	☆	☆	☆	§Special	T-13S41
WESTONE RADIO CORP.						
11, 12, 70, 70C.....	T-13R03	☆	☆	☆	☆	T-57S01
WILCOX-GAY CORP.						
2S5, 2T5.....	T-13R02	☆	☆	☆	☆	T-57S01
2VA7, 2VB7.....	T-13R02	☆	☆	☆	☆	T-57S01
3D5, 3F7.....	T-13R02	☆	☆	☆	☆	T-57S01
3S5-66, 3SB5.....	T-13R12	☆	☆	☆	☆	T-57S01
3V6, 3VA6.....	T-13R12	☆	☆	☆	☆	T-57S01
3VB6.....	T-13R12	☆	☆	☆	☆	T-57S01
4C5, 4CA5.....	T-13R11	☆	☆	☆	☆	T-57S01
4CB5, 4CD5.....	T-13R11	☆	☆	☆	☆	T-57S01
4D10, 4DB10.....	T-13R06	☆	☆	☆	☆	T-58S72
4E6, 4G7.....	T-13R12	☆	☆	☆	☆	T-57S01
4H11.....	T-13R09	☆	☆	☆	☆	T-67S92
5B5.....	T-13R12	☆	☆	☆	☆	T-57S01
5BA5.....	T-13R11	☆	☆	☆	☆	T-57S01
5BC5.....	T-13R12	☆	☆	☆	☆	T-57S01
5BE6.....	T-13R11	☆	☆	☆	☆	T-57S01
5E7, 5EA7.....	T-13R12	☆	☆	☆	☆	T-57S01
5E8, 5E9.....	T-13R12	☆	☆	☆	☆	T-57S01
6A5.....	T-13R19	☆	☆	☆	☆	T-57S01
6B5.....	T-13R13	☆	☆	☆	☆	T-57S01
6B8, 6F6.....	T-13R19	☆	☆	☆	☆	T-57S01
6FB6.....	T-13R19	☆	☆	☆	☆	T-57S01
6T11.....	T-13R14	☆	☆	☆	☆	T-57S01
7E5.....	T-13R11	☆	☆	☆	☆	T-57S01
7G5, 7GB5.....	T-13R11	☆	☆	☆	☆	T-57S01
7J7, 7K7.....	T-13R13	☆	☆	☆	☆	T-57S01
A69.....	T-13R19	☆	☆	☆	☆	T-57S01
A70, A81, A82.....	T-13R14	☆	☆	☆	☆	T-57S01
A78, A79.....	T-13R12	☆	☆	☆	☆	T-57S01
RUDOLPH WURLITZER CO. (Also see All-American Mohawk)						
SA5.....	T-13R02	☆	☆	☆	☆	T-57S01
SA6.....	T-13R03	☆	☆	☆	☆	T-57S01
SW88.....	T-13R03	☆	☆	☆	☆	T-57S01
SA91-A, SA120.....	T-13R06	☆	☆	☆	☆	T-57S01
450.....	T-13R02	☆	☆	☆	☆	T-57S01
454.....	T-13R11	☆	☆	☆	☆	T-57S01
470, 471.....	T-13R12	☆	☆	☆	☆	T-57S01
480.....	T-13R13	☆	☆	☆	☆	T-57S01
ZENITH RADIO CORP.						
A, B, C, D.....	T-13R03 T-13C29	☆	☆	☆	☆	T-57S01
BH(202).....	T-13R05 T-13C29	☆	☆	☆	☆	T-57S01
CH.....	T-13R04	☆	☆	☆	☆	T-57S01
L.....	T-13R01 T-13C28	☆	☆	☆	☆	T-57S01
LH, MH.....	T-13R04	☆	☆	☆	☆	T-57S01
RH.....	T-13R04	☆	☆	☆	☆	T-57S01
WH (2022).....	T-13R04	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
ZENITH RADIO CORP. (Contd)						
4B313 (5410) 4B314 (5411).....	T-14R39	☆	☆	☆	☆	T-57S01
4B317, 4B355.....	T-14R39	☆	☆	☆	☆	T-57S01
4D26 (5401) 4P51..	T-13R12	☆	☆	☆	☆	T-57S01
4T26, 4T51.....	T-13R12	☆	☆	☆	☆	T-57S01
5A119.....	T-13R20	☆	☆	☆	☆	T-57S01
5A126.....	T-13R20	☆	☆	☆	☆	T-57S01
5A127.....	T-13R20	☆	☆	☆	☆	T-57S01
5A151 (CH5517A)...	T-13R20	☆	☆	☆	☆	T-57S01
5A313B(CH5535BT)	T-13R11	☆	☆	☆	☆	T-57S01
5A318, 5A325 (5532A).....	T-13R11	☆	☆	☆	☆	T-57S01
5R123 (5519).....	T-13R12	☆	☆	☆	☆	T-57S01
5R135, 5R165.....	T-13R12	☆	☆	☆	☆	T-57S01
5R216 (5526).....	T-13R19	☆	☆	☆	☆	T-57S01
5R226, 5R236.....	T-13R19	☆	☆	☆	☆	T-57S01
5R303 (5528) 5R312	T-13R11	☆	☆	☆	☆	T-57S01
5R316, 5R317.....	T-13R11	☆	☆	☆	☆	T-57S01
5R337.....	T-13R11	☆	☆	☆	☆	T-57S01
5S29 (5513A) 5S56..	T-13R12	☆	☆	☆	☆	T-57S01
5S119.....	T-13R12	☆	☆	☆	☆	T-57S01
5S126, 5S127, 5S150	T-13R12	☆	☆	☆	☆	T-57S01
5S151, 5S161.....	T-13R12	☆	☆	☆	☆	T-57S01
5S201 (5521).....	T-13R12	☆	☆	☆	☆	T-57S01
5S218.....	T-13R12	☆	☆	☆	☆	T-57S01
5S218AT (5521AT).	T-13R12	☆	☆	☆	☆	T-57S01
5S220, 5S228, 5S228AT.....	T-13R12	☆	☆	☆	☆	T-57S01
5S237, 5S237AT....	T-13R12	☆	☆	☆	☆	T-57S01
5S250, 5S252.....	T-13R12	☆	☆	☆	☆	T-57S01
5S319 (5529) 5S327.	T-13R11	☆	☆	☆	☆	T-57S01
5S330, 5S338.....	T-13R11	☆	☆	☆	☆	T-57S01
5S339.....	T-13R11	☆	☆	☆	☆	T-57S01
6A203.....	T-13R20	☆	☆	☆	☆	T-57S01
6A223.....	T-13R20	☆	☆	☆	☆	T-57S01
6A229.....	T-13R20	☆	☆	☆	☆	T-57S01
6A239.....	T-13R20	☆	☆	☆	☆	T-57S01
6A241.....	T-13R20	☆	☆	☆	☆	T-57S01
6B321 (5653).....	T-14R39	☆	☆	☆	☆	T-57S01
6S27 (5619) 6S28...	T-13R12	☆	☆	☆	☆	T-57S01
6S52, 6S53.....	T-13R12	☆	☆	☆	☆	T-57S01
6S128 (5634), 6S137	T-13R12	☆	☆	☆	☆	T-57S01
6S147, 6S152, 6S157	T-13R12	☆	☆	☆	☆	T-57S01
6S203 (5638), 6S222	T-13R12	☆	☆	☆	☆	T-57S01
6S223, 6S229.....	T-13R12	☆	☆	☆	☆	T-57S01
6S239, 6S241.....	T-13R12	☆	☆	☆	☆	T-57S01
6S254 (5644).....	T-13R12	☆	☆	☆	☆	T-57S01
6S254AT (5644AT).	T-13R12	☆	☆	☆	☆	T-57S01
6S256, 6S256AT....	T-13R12	☆	☆	☆	☆	T-57S01
6S301 (5651) 6S306.	T-13R11	☆	☆	☆	☆	T-57S01
6S321, 6S322.....	T-13R11	☆	☆	☆	☆	T-57S01
6S330, 6S340.....	T-13R11	☆	☆	☆	☆	T-57S01

☆ None required. § Available upon special order from your distributor. Special Note: The following substitutions are made by many service engineers because of preferences in mountings and sizes. T-57S02, T-13S38, T-14S85 in place of T-57S01; T-57A41, T-13A35 in place of T-33A91; T-57A38, T-13A34 in place of T-29A99.

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
ZENITH RADIO CORP. (Contd)						
6S341 (5649).....	T-13R12	☆	☆	☆	☆	T-57S01
6S361.....	T-13R11	☆	☆	☆	☆	T-57S01
6S362.....	T-13R12	☆	☆	☆	☆	T-57S01
6S439, 6S469.....	T-13R20*	☆	☆	☆	☆	T-57S01
7S28, 7S53 (5704)...	T-13R13	☆	☆	☆	☆	T-57S01
7S232AT (5709AT)...	T-13R12	☆	☆	☆	☆	T-57S01
7S240.....	T-13R12	☆	☆	☆	☆	T-57S01
7S242.....	T-13R12	☆	☆	☆	☆	T-57S01
7S258.....	T-13R12	☆	☆	☆	☆	T-57S01
7S260.....	T-13R12	☆	☆	☆	☆	T-57S01
7S261.....	T-13R12	☆	☆	☆	☆	T-57S01
7S323 (5714) 7S342.	T-13R12	☆	☆	☆	☆	T-57S01
7S343.....	T-13R12	☆	☆	☆	☆	T-57S01
7S363, 7S364.....	T-13R12	☆	☆	☆	☆	T-57S01
7S366.....	T-13R12	☆	☆	☆	☆	T-57S01
7S432, 7S433, 7S434, 7S449.....	T-13R20*	☆	☆	☆	☆	T-57S01
7S450, 7S458 to 7S462.....	T-13R20*	☆	☆	☆	☆	T-57S01
7S487, 7S488, 7S490 (5725).....	T-13R19*	☆	☆	☆	☆	T-57S01
8A129.....	T-13R20	☆	☆	☆	☆	T-57S01
8A147.....	T-13R20	☆	☆	☆	☆	T-57S01
8A154.....	T-13R20	☆	☆	☆	☆	T-57S01
8A157.....	T-13R20	☆	☆	☆	☆	T-57S01
8A232.....	T-13R20	☆	☆	☆	☆	T-57S01
8A242.....	T-13R20	☆	☆	☆	☆	T-57S01
8A244.....	T-13R20	☆	☆	☆	☆	T-57S01
8A262.....	T-13R20	☆	☆	☆	☆	T-57S01
8S129 (5801) 8S154.	T-13R12	☆	☆	☆	☆	T-57S01
8S359.....	T-13R20	☆	☆	☆	☆	T-57S01
9S30, 9S54.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
9S55.....	T-13R14	☆	☆	☆	T-33A91	T-57S01
9S203 (5905).....	T-13R13	☆	☆	☆	☆	T-57S01
9S204AT (5905AT)...	T-13R12	☆	☆	☆	☆	T-57S01
9S232.....	T-13R13	☆	☆	☆	☆	T-57S01
9S232AT.....	T-13R12	☆	☆	☆	☆	T-57S01
9S242.....	T-13R13	☆	☆	☆	☆	T-57S01
9S244.....	T-13R13	☆	☆	☆	☆	T-57S01
9S244AT.....	T-13R12	☆	☆	☆	☆	T-57S01
9S262, 9S263.....	T-13R13	☆	☆	☆	☆	T-57S01
9S264.....	T-13R13	☆	☆	☆	☆	T-57S01
9S264AT.....	T-13R12	☆	☆	☆	☆	T-57S01
9S307 (5907).....	T-13R12	☆	☆	☆	☆	T-57S01
9S324, 9S344.....	T-13R12	☆	☆	☆	☆	T-57S01
9S365 (5906).....	T-13R12	☆	☆	☆	☆	T-57S01
9S367, 9S369.....	T-13R12	☆	☆	☆	☆	T-57S01
10.....	T-13R04	☆	☆	☆	☆	T-57S01
10S130 (1004).....	T-13R15 T-13C30	☆	☆	☆	T-33A91	T-13S41
10S147, 10S153.....	T-13R15 T-13C30	☆	☆	☆	T-33A91	T-13S41
10S155, 10S156.....	T-13R15 T-13C30	☆	☆	☆	T-33A91	T-13S41
10S157, 10S160.....	T-13R15 T-13C30	☆	☆	☆	T-33A91	T-13S41

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
ZENITH RADIO CORP. (Contd)						
10S443, 10S452, 10S464, 10S470, 10S491 10S492 (1005)	T-17R34	☆	☆	☆	☆	T-13S41
11, 12.....	T-13R04	☆	☆	☆	☆	T-57S01
12S205, 12S232.....	T-13R15	☆	☆	☆	☆	T-13S41
12S245, 12S265.....	T-13R15	☆	☆	☆	☆	T-13S41
12S266, 12S267.....	T-13R15	☆	☆	☆	☆	T-13S41
12S268.....	T-13R15	☆	☆	☆	☆	T-13S41
12S345 (1206).....	T-13R13	☆	☆	☆	☆	T-13S42
12S370, 12S371.....	T-13R13	☆	☆	☆	☆	T-13S42
12U158 (1203).....	T-13R15 T-13C30	☆	☆	☆	T-33A91	T-13S41
12U159.....	T-13R15 T-13C30	☆	☆	☆	T-33A91	T-13S41
50, 52, 53, 54.....	T-13R06 T-13C30	☆	☆	T-33A91	T-13A36	T-57S01
60, 61, 62.....	T-13R06 T-13C30	☆	☆	T-33A91	T-13A36	T-57S01
64, 67.....	T-13R06 T-13C30	☆	☆	T-33A91	T-13A36	T-57S01
70, 71, 72, 73, 77...	T-13R06 T-13C30	☆	☆	T-33A91	T-13A36	T-57S01
80.....	T-13R06 T-13C30	☆	☆	T-33A91	T-13A36	T-57S01
91, 92, 103.....	T-13R06 T-13C30	☆	☆	T-33A91	T-57S01	
210, 211.....	T-13R03	☆	☆	☆	☆	T-57S01
215, 216, 217.....	T-13R04	☆	☆	☆	☆	T-57S01
220, 221.....	T-13R03	☆	☆	☆	☆	T-57S01
225.....	T-13R04	☆	☆	☆	☆	T-57S01
230, 240.....	T-13R05	☆	☆	☆	☆	T-57S01
241, 244.....	T-13R05	☆	☆	☆	☆	T-57S01
245.....	T-13R05	☆	☆	☆	☆	T-57S01
250, 251, 252.....	T-13R03	☆	☆	☆	☆	T-57S01
258, 259.....	T-13R04	☆	☆	☆	☆	T-57S01
260, 261.....	T-13R03	☆	☆	☆	☆	T-57S01
262.....	T-13R04	☆	☆	☆	☆	T-57S01
268, 269.....	T-13R04	☆	☆	☆	☆	T-57S01
272.....	T-13R03	☆	☆	☆	☆	T-57S01
273.....	T-13R06 T-13C30	☆	☆	☆	§Special	T-57S01
278, 280, 281.....	T-13R04	☆	☆	☆	☆	T-57S01
288, 289.....	T-13R04	☆	☆	☆	☆	T-57S01
291, 292.....	T-13R03	☆	☆	☆	☆	T-57S01
410, 411, 412, 414..	T-13R06 T-13C30	☆	☆	☆	T-17D01	T-13S41
420.....	T-13R06 T-13C30	☆	☆	☆	T-17D01	T-13S41
443, 444.....	T-13R06 T-13C30	☆	☆	☆	T-17D01	T-13S41
472.....	T-13R04	☆	☆	☆	☆	T-57S01
473.....	T-13R06 T-13C30	☆	☆	☆	T-17D01	T-13S41
474, 475.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
476.....	T-13R06 T-13C30	☆	☆	☆	T-17D01	T-13S41
476B.....	T-13R06 T-13C30	☆	☆	☆	T-33A91	T-57S01
478.....	T-13R04	☆	☆	☆	☆	T-57S01
500, 501, 502, 503..	T-13R05	☆	☆	☆	☆	T-13S41
514, 515, 516.....	T-13R05	☆	☆	☆	☆	T-13S41
520 (2035), 521.....	T-13R06 T-13C30	☆	☆	☆	T-67D78	T-67S52
558, 568, 578.....	T-13R04	☆	☆	☆	☆	T-57S01
589, 590.....	T-13R04	☆	☆	☆	☆	T-57S01
600.....	T-13R05	☆	☆	☆	☆	T-13S41
M601.....	T-13R03	☆	☆	☆	☆	T-57S01

Tropex transformers will stay put on those tough replacement jobs. See page 32.



MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
ZENITH RADIO CORP. (Contd)						
602, 605, 608.....	T-13R06	T-13C30	☆	☆	T-67D78	T-67S52
611, 612.....	T-13R06	T-13C30	☆	☆	T-67D78	T-67S52
615.....	T-13R06	T-13C30	☆	☆	T-67D78	T-67S52
616, 618.....	T-13R06	☆	☆	☆	☆	T-13S41
622, 642.....	T-13R04	T-13C30	☆	☆	T-33A91	T-57S01
705, 706, 707.....	T-13R03	☆	☆	☆	☆	T-57S01
711, 712.....	T-13R03	☆	☆	☆	☆	T-57S01
715.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
722, 725, 732.....	T-13R04	T-13C30	☆	☆	T-33A91	T-57S01
750.....	T-13R03	☆	☆	☆	☆	T-57S01
755, 756.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
760, 765, 767.....	T-13R04	☆	☆	☆	T-33A91	T-57S01
770, 770B, 775, 775B	T-13R06	T-13C30	☆	☆	T-33A91	T-57S01
777, 780, 788.....	T-13R06	T-13C30	☆	☆	T-17D01	T-13S41
805, 806.....	T-13R12	☆	☆	☆	☆	T-57S01
807, 808.....	T-13R12	☆	☆	☆	☆	T-57S01
809, 814 (5611).....	T-13R12	☆	☆	☆	☆	T-57S01
815 (5612) 825.....	T-13R12	☆	☆	☆	☆	T-57S01
827, 827.....	T-13R12	☆	☆	☆	☆	T-57S01

MODEL	Power Trans.	First Filter Choke	Second Filter Choke	First Audio Trans.	Second Audio Trans.	Output Trans.
ZENITH RADIO CORP. (Contd)						
829, 829 (5701R)...	T-13R12	☆	☆	☆	☆	T-57S01
835.....	T-13R15	T-13C30	☆	☆	T-17D01	T-65S94
845.....	T-13R12	☆	☆	☆	☆	T-57S01
8847, 850.....	T-13R12	☆	☆	☆	☆	T-57S01
860, 861, 864.....	T-13R12	☆	☆	☆	☆	T-57S01
8870, (5702R).....	T-13R12	☆	☆	☆	☆	T-57S01
8871 (5703R).....	T-13R12	☆	☆	☆	☆	T-57S01
880 (1001) (1001A).....	T-13R15	T-13C30	☆	☆	T-17D01	T-65S94
908, 909.....	T-13R12	☆	☆	☆	☆	T-57S01
935.....	T-13R15	T-13C30	☆	☆	T-17D01	T-13S41
945, 950.....	T-13R12	☆	☆	☆	☆	T-57S01
960, 961.....	T-13R12	☆	☆	☆	☆	T-57S01
970, 975.....	T-13R04	T-13C29	☆	☆	T-33A91	T-57S01
980, 985, 990 (1201).....	T-13R15	T-13C30	☆	T-29A99	T-74D32	T-13S41
1105.....	T-13R15	T-13C30	☆	☆	T-17D01	T-13S41
1117, 1161.....	T-13R12	☆	☆	☆	☆	T-57S01
1167, 1170.....	T-13R12	☆	☆	☆	☆	T-57S01
2038.....	T-56R05	T-13C30	☆	☆	☆	T-67S52
2056, 2056-1.....	T-13R04	☆	☆	☆	☆	T-57S01

POWER TRANSFORMERS

The choice of servicemen in all parts of the world because of the universal adaptability to receiver replacement, from both electrical and mechanical considerations. Designed to furnish plate and filament voltage requirements of amplifiers, receivers and exciter stages of transmitters. Adjustable mounting brackets Fig. 3A permit flush, vertical or horizontal mounting.



Type No.	Pri. V.A.	Secondary		Filament Windings				Mtg. Centers			Dimensions				Wt. Lbs.
		A.C. Load Volts	D.C. M.A.	Rect. Fil.	Fil. No. 1	Fil. No. 2	Fil. No. 3	Fig.	Width	Depth	W.	D.	H.		
T-13R00	70	275-0-275	70	5V-3A	5V-.5A Ct.	2.5V-10.5 A.Ct.		3A	2 1/4	2 1/8	2 1/8	3 1/8	3 1/8	3 1/8	4
T-13R01	60	325-0-325	40	5V-3A	2.5V-4A Ct.			3A	2 1/8	2 1/8	2 1/8	2 3/4	3	3 1/4	
T-13R02	60	350-0-350	50	5V-3A	2.5V-7.25A Ct.			3A	2 1/8	2 1/8	2 1/8	2 15/16	3	3 3/4	
T-13R03	75	350-0-350	70	5V-3A	2.5V-9A Ct.			3A	2 1/4	2 1/8	2 1/8	3 1/8	3 1/8	3 1/8	4
T-13R04	115	350-0-350	100	5V-3A	2.5V-12.5A Ct.			3A	2 1/2	3 1/8	3 1/8	3 3/4	3 3/4	5 1/4	
T-13R05	110	350-0-350	70	5V-3A	2.5V-9A Ct.	2.5V-3.5A Ct.		3A	2 1/2	3 1/8	3 1/8	3 1/8	3 3/8	5 1/4	
T-13R06	130	350-0-350	120	5V-3A	2.5V-12.5A Ct.	2.5V-3.5A Ct.		3A	3	3 3/4	3 3/4	3 3/8	4 1/2	6 1/2	
T-13R07	140	400-0-400	110	5V-3A	2.5V-15A Ct.	2.5V-3.5A Ct.		3A	3	3 3/4	3 3/4	3 1/2	4 1/2	6 3/4	
T-13R08	105	350-0-350	90	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.		3A	2 1/2	3 1/8	3 1/8	3 1/8	3 3/8	5 1/4	
T-13R09	160	375-0-375	180	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.		3A	3	3 3/4	3 3/4	3 3/8	4 1/2	7 1/2	
T-13R11	60	290-0-290	50	5V-3A	6.3V-2A Ct.			3A	2 1/8	2 1/8	2 1/8	2 3/4	3	3 1/4	
T-13R12	65	350-0-350	70	5V-3A	6.3V-2.5A Ct.			3A	2 1/8	2 1/8	2 1/8	2 3/8	3	3 1/4	
T-13R13	90	350-0-350	90	5V-3A	6.3V-3.5A Ct.			3A	2 1/2	3 1/8	3 1/8	3 3/8	3 3/4	5 1/4	
T-13R14	115	350-0-350	120	5V-4A	6.3V-4.7A Ct.			3A	2 1/2	3 1/8	3 1/8	3 1/8	3 3/4	5 1/4	
T-13R15	140	375-0-375	150	5V-4A	6.3V-5A Ct.			3A	3	3 3/4	3 3/4	3 3/8	4 1/2	6 1/2	
T-13R16	180	400-0-400	200	5V-4A	6.3V-5.14A Ct.			3A	3	3 3/4	3 3/4	3 11/16	4 1/2	7 1/4	
T-13R17	85	300-0-300	60	5V-3A	6.3V-2.5A Ct.	2.5V-7.5A Ct.		3A	2 1/4	2 1/8	2 1/8	3 3/8	3 3/8	4 1/2	
T-13R18	115	350-0-350	90	5V-3A	6.3/2.5-3.5A Ct.	2.5V-9A Ct.		3A	3	3 3/4	3 3/4	3 3/4	4 1/2	5 3/4	
T-13R19	45	240-0-240	40	5V-2A	6.3V-2A Ct.			3A	2 1/8	2 1/8	2 1/8	2 1/8	3	2 1/2	
T-13R20	60	305-0-305	70	5V-2A	6.3V-3.5A Ct.			3A	2 1/8	2 1/8	2 1/8	2 3/8	3	3 1/4	
T-14R35		260*	60	For use with vibrator operating from 6V battery.				3C	2 1/8	2 1/8	2 1/8	2 1/8	2 3/8	3 1/2	2 1/2
T-14R39		150*	40	For use with vibrator operating from 6V battery.				2B	2 3/8		2 3/8	2	2 3/8	1 1/4	
T-17R34	90	300-0-300	125	5V-2A	6.3V-4.8A Ct.			2G	2 1/8	2 1/8	2 1/8	3 3/8	3 3/8	4 3/4	4 3/4
T-37R70-C	95	350-0-350	80	5V-2A Ct.	3V-10A Ct.	5V-2.5A Ct.		2G	2 1/8	2 1/8	2 1/8	3 3/8	3 3/8	4 3/4	6 3/4
For Sparton Models 235, 589, 593, 600 Series, 737, 931 and other receivers using Kellogg and other 3V tubes.															
T-56R01	60	325-0-325	70	5V-2A	2.5V-3A Ct.	1.5V-1A 1.5V-4A	5V-.5A Ct.	2G	2 1/8	3	3 3/8	3 3/8	4 3/8	5 3/4	
T-56R02-	70	350-0-350	70	5V-2A	2.5V-9A Ct.	2.5V-1.5A Ct.		2G	2 1/8	2 1/8	2 1/8	3 3/8	3 3/8	4 3/8	6
T-56R03	85	350-0-350	105	5V-3A	2.5V-3A Ct.	2.5V-1.75A Ct.	1.5V-5A 1.5V-1A	2G	3	2 1/8	3 3/4	3 3/4	4 1/8	7 1/4	
T-56R05	115	350-0-350	110	5V-3A	2.5V-9A Ct.	2.5V-3A Ct.	2.5V-3A Ct.	2G	3	2 1/8	3 3/4	3 11/16	4 1/8	7 3/4	

* D.C. volts to filter

AUDIO TRANSFORMERS AND CHOKES LISTED ON PAGES 2 AND 3.

This accurate and convenient table has been compiled to facilitate choosing the correct output transformer. Two types are offered for most tubes: the

universal type, which is designed to accommodate a wide range of tube and voice coil impedances, and the specific duty type.

TUBE	PLATE VOLTS	BIAS VOLTS	PLATE M. A.	PLATE LOAD OHMS	WATTS OUTPUT	UNIVERSAL TYPE TRANSFORMER	SPECIFIC DUTY TRANSFORMER
1A5G.....	90	-4.5	4.0	25,000	.115		T-14S83
1C5G.....	90	-7.5	7.5	8,000	.240	T-13S38†	T-14S84
1D8GT.....	90	-9.0	5.0	12,000	.200	T-13S38†	
1E7G (1 section).....	135	-4.5	7.5	16,000	.290	T-13S38†	T-13S43
(2 sections, P-P).....	135	-7.5	*3.5	24,000	.575		T-14S83
1F4, 1F5G.....	135	-4.5	8.0	16,000	.310	T-13S38†	T-13S43
1G5G.....	90	-6.0	8.5	8,500	.250	T-13S38†	T-14S84
1G6G.....	90	0	*1.0	12,000	.675	T-13S38†	
1J5G.....	135	-16.5	7.0	13,500	.450	T-13S38†	
1J6G.....	135	0	*5.0	10,000	2.1	T-13S38†	T-81S01
1N6G.....	90	-4.5	3.1	25,000	.100		T-14S83
1Q5G, 1Q5GT.....	90	-4.5	9.5	8,000	.270	T-13S38†	T-14S84
1S4.....	45	-4.5	3.8	8,000	.065	T-13S38†	T-14S84
1T5GT.....	90	-6.0	6.5	14,000	.170	T-13S38†	T-13S43
2A3 (Single Cl. A).....	250	-45.0	60.0	2,500	3.5	T-13S42	T-17S10
(P-P AB fixed bias)...	300	-62.0	*40.0	3,000	15.0	T-13S41	T-58S72
(P-P AB self bias)...	300	-62.0	*40.0	5,000	10.0	T-13S41	(C.H.T., T-15S91) T-67S54 (C.H.T., T-15S90)
2A5 (Single Cl. A).....	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
(Single Cl. A).....	285	-20.0	38.0	7,000	4.5	T-13S42	T-13S37
(P-P Cl. A).....	250	-16.5	*34.0	14,000	6.2	T-57S01§	T-67S51
(P-P Cl. AB ₁).....	315	-24.0	*31.0	10,000	11.0	T-13S41	T-75S75
(P-P Cl. AB ₂).....	375	-21.0	*27.0	10,000	19.0	T-13S41	T-75S75
3Q5GT (Fil. par.).....	90	-4.5	9.5	8,000	.270	T-13S38†	T-14S84
(Fil. series).....	90	-4.5	7.5	8,000	.230	T-13S38†	T-14S84
4A6G.....	90	-1.5	*1.1	8,000	1.0	T-13S38†	T-14S81
6A8.....	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
6A4.....	180	-12.0	22.0	8,000	1.4	T-13S38†	T-13S37
6A5G.....	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
6A6.....	300	0	*17.5	8,000	10.0	T-13S41	T-67S48
6AC5G.....	250	self	32.0	7,000	3.7	T-13S42	T-13S37
(P-P Cl. B).....	250	0	*2.5	10,000	8.0	T-13S41	T-75S75
6AL6G.....	250	-14.0	72.0	2,500	6.5	T-13S42	T-17S10
6B4G (Single Cl. A).....	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
(P-P AB fixed bias)...	325	-68.0	*40.0	3,000	15.0	T-13S41	T-58S72
(P-P AB self bias)...	325	-68.0	*40.0	5,000	10.0	T-13S41	(C.H.T., T-15S91) T-67S54 (C.H.T., T-15S90)
6B5.....	300	0	42.0	7,000	4.0	T-13S42	T-13S37
6E6.....	250	-27.5	*18.0	14,000	1.6	T-57S01§	T-13S40
6F6.....	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
6G6G.....	180	-9.0	15.0	10,000	1.1	T-13S38†	
6G6G.....	135	-6.0	11.5	12,000	.6	T-13S38†	
6K6G.....	315	-21.0	25.5	9,000	4.5	T-57S01§	
6K6G.....	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
6L6 (Single Cl. A).....	250	-14.0	72.0	2,500	6.5	T-13S42	T-17S10
(Single Cl. A).....	320	-20.0	76.0	2,500	8.0		T-17S10
(P-P Cl. A ₁).....	270	-16.5	*67.5	5,000	18.5		T-67S54 T-15S91 (C.H.T., T-15S90)
(P-P Cl. AB ₁).....	319	-23.0	*50.0	4,300	25.0		(C.H.T., T-15S91) T-17S12 (C.H.T., T-15S91)
(P-P Cl. AB ₂).....	400	-25.0	*51.0	6,600	34.0		(C.H.T., T-15S92) T-17S13 (C.H.T., T-15S92)
(P-P Cl. AB ₃).....	430	-20.0	*47.0	5,500	40.0		(C.H.T., T-15S92) T-17S14 (C.H.T., T-15S92)
(P-P-Par. Cl. AB ₁)...	410	-28.0	*50.0	3,300	60.0		(C.H.T., T-15S93) T-17S15 (C.H.T., T-15S93)
(P-P-Par. Cl. AB ₂)...	430	-24.5	*52.0	1,900	120.0		(C.H.T., T-15S94) T-17S16 (C.H.T., T-15S94)

* Zero signal per plate. † T-14S85 may be used when a transformer with leads is preferred to one with lugs. § T-57S02 may be used when a transformer with leads is preferred to one with lugs.



TUBE	PLATE VOLTS	BIAS VOLTS	PLATE M. A.	PLATE LOAD OHMS	WATTS OUTPUT	UNIVERSAL TYPE TRANS-FORMER	SPECIFIC DUTY TRANS-FORMER
6N6G.....	300	0	42.0	7,000	4.0	T-13S42	T-13S37
6N7.....	300	0	*17.5	8,000	10.0	T-13S41	T-67S48
6V6 (Single Cl. A).....	250	-12.5	44.5	5,000	4.5	T-13S42	
(Single Cl. A.).....	315	-13.0	34.0	8,500	5.5	T-57S01§	
(P-P Cl. AB.).....	250	-15.0	*35.0	10,000	10.0	T-13S41	T-75S75
(P-P Cl. AB.).....	306	-20.0	*50.0	8,000	15.0	T-13S41	T-17S11
						(C.H.T., T-15S90)	
6Y6G.....	135	-13.5	58.0	2,000	3.6	T-13S42	T-17S10
6Y6G.....	200	-14.0	61.0	2,600	6.0	T-13S42	T-17S10
6Y7G.....	180	0	*3.8	7,000	5.5	T-13S42	T-67S48
6Y7G.....	250	0	*5.3	14,000	8.0	T-57S01§	T-13S40
6Z7G.....	135	0	*3.0	9,000	2.5	T-13S38†	T-81S01
6Z7G.....	180	0	*4.2	12,000	4.2	T-13S38†	T-13S40
7A5.....	110	-7.5	35.0	2,500	1.4	T-13S42	T-17S10
7B5.....	100	-7.0	9.0	12,000	.35	T-13S38†	
7B5.....	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
7C5.....	250	-12.5	45.0	5,000	4.5	T-13S42	T-89S74
(P-P Cl. AB.).....	250	-15.0	*35.0	10,000	10.0	T-13S41	T-75S75
10.....	425	-50.0	18.0	10,000	1.6	T-57S01§	
12A5.....	100	-15.0	17.0	4,500	.8	T-13S42	T-13S39
12A5.....	180	-25.0	45.0	3,300	3.4	T-13S42	T-13S39
12A7.....	135	-13.5	9.0	13,500	.55	T-13S38†	T-13S43
18.....	250	-16.5	34.0	7,000	3.0	T-13S42	T-13S37
19.....	135	0	*5.0	10,000	2.1	T-13S38†	T-81S01
25A6.....	95	-15.0	20.0	4,500	.9	T-13S42	T-13S39
25A7G.....	100	-15.0	20.5	4,500	.770	T-13S42	T-13S39
25AC5GT.....	180	0	27.0	8,000	2.0	T-13S38†	T-13S37
(P-P Cl. B).....	180	0	*2.0	4,800	6.0	T-13S41	T-67S54
25B6G.....	105	-16.0	48.0	1,700	2.4	T-13S42	T-14S82
25L6.....	110	-7.5	49.0	1,500	2.1	T-13S42	T-14S82
31.....	135	-22.5	8.0	7,000	.185	T-13S42	T-13S37
32L7GT.....	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
33.....	135	-13.5	14.5	7,000	.7	T-13S42	T-13S37
35A5-LT.....	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
35L6GT.....	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
38.....	135	-13.5	9.0	13,500	.55	T-13S38†	
38.....	250	-25.0	22.0	10,000	2.5	T-13S38†	
41.....	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
42.....	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
43.....	95	-15.0	20.0	4,500	.9	T-13S42	T-13S39
45 (Single Cl. A).....	250	-50.0	34.0	3,900	1.6	T-13S42	T-89S74
(P-P Cl. AB.).....	275	-56.0	*36.0	5,060	12.0	T-13S41	T-67S54
46 (Single Cl. A Triode).....	250	-33.0	22.0	6,400	1.25	T-13S42	T-13S37
(P-P Cl. B).....	400	0	*6.0	5,800	20.0	T-13S41	T-67S52
47.....	250	-16.5	31.0	7,000	2.7	T-13S42	T-13S37
(P-P Cl. A).....	250	-16.5	*31.0	14,000	5.4	T-57S01§	T-67S51
48.....	96	-19.0	52.0	1,500	2.0	T-13S42	T-14S82
(P-P Cl. A, Pent.).....	125	-20.0	*50.0	3,000	5.0	T-13S41	T-58S72
49 (P-P Cl. B).....	135	0	*1.3	8,000	2.3	T-13S38†	T-14S81
50 (P-P Cl. A).....	450	-84.0	*55.0	8,000	9.2	T-13S41	T-65S94
50C6G.....	135	-13.5	58.0	2,000	3.6	T-13S42	T-17S10
50L6GT.....	110	-7.5	49.0	1,500	2.1	T-13S42	T-14S82
52.....	110	0	43.0	2,000	1.5	T-13S42	T-17S10
(P-P Cl. B).....	180	0	*1.5	10,000	5.0	T-57S01§	T-81S01
53.....	300	0	*17.5	8,000	10.0	T-13S41	T-67S48
59 (Single Cl. A Triode).....	250	-28.0	26.0	5,000	1.25	T-13S42	T-13S39
(Single Cl. A Pent.).....	250	-18.0	35.0	6,000	3.0	T-13S42	T-13S37
(P-P Cl. B).....	400	0	*13.0	6,000	20.0	T-13S41	T-67S52
70L7-GT.....	110	-7.5	40.0	2,000	1.8	T-13S42	T-17S10
71-A.....	180	-40.5	20.0	4,800	.79	T-13S42	T-13S39
(P-P Cl. A).....	180	-40.5	*20.0	8,000	1.6	T-13S38†	T-33S99
79.....	180	0	*3.8	7,000	5.5	T-13S42	T-67S48
89.....	250	-25.0	32.0	6,750	3.4	T-13S42	T-13S37
182B/482B.....	250	-35.0	20.0	4,500	1.35	T-13S42	T-13S39
183/483.....	250	-65.0	20.0	4,500	1.8	T-13S42	T-13S39
950.....	135	-16.5	7.0	13,500	.450	T-13S38†	

*Zero signal per plate. †T-14S85 may be used when a transformer with leads is preferred to one with lugs. §T-57S02 may be used when a transformer with leads is preferred to one with lugs.



**YOU MAY NOT
WORK UNDER
these conditions
BUT---**

... even if you did, THORDARSON TROPEX transformers would give you complete protection against moisture, high humidity and salt air.

The TROPEX process was perfected for just that purpose. It thoroughly impregnates the coil against the corrosive effects of adverse weather conditions.

TROPEX is a special process which may be applied to any Thordarson open mounting type transformer or choke. It is especially adaptable to fine wire audio transformers and chokes but is not ordinarily recommended for power transformers nor for encased types.

The additional cost for THORDARSON TROPEX transformers is surprisingly small. The following table has been compiled to enable you to easily determine this price increase by referring to the weight of the transformer as listed.

When ordering TROPEX add an "X" to the regular type number. For example, T-13S38-X is the TROPEX equivalent of T-13S38.

WEIGHT OF TRANSFORMER	ADD TO LIST PRICE
Up to $\frac{1}{8}$ lb.	25c
From 1 lb. to $1\frac{1}{8}$ lbs.	30c
From 2 lbs. to $2\frac{1}{8}$ lbs.	50c
From 3 lbs. to $4\frac{1}{8}$ lbs.	65c
From 5 lbs. to $6\frac{1}{8}$ lbs.	75c
Over 7 lbs.	13c per lb.

TROPEX REPLACEMENT AUDIO TRANSFORMERS

Type No.	Application
T-13A34-X	10,000 ohm plate to single grid
T-29A99-X	10,000 ohm plate to single grid
T-13A35-X	10,000 ohm plate to P.P. grids
T-33A91-X	10,000 ohm plate to P.P. grids
T-13A36-X	P.P. 10,000 ohm plates to P.P. grids
T-78D46-X	Single 30 to Class B 19, 1J6G, or 30's
T-17D01-X	Single 6F6 etc., to 2-6F6, etc.

TROPEX FILTER CHOKES

T-13C26-X	8 Hy at 40 M.A. 530 ohms D.C.
T-13C27-X	10 Hy at 40 M.A. 475 ohms D.C.
T-13C28-X	10 Hy at 65 M.A. 460 ohms D.C.
T-13C29-X	9 Hy at 85 M.A. 250 ohms D.C.
T-13C30-X	8 Hy at 150 M.A. 200 ohms D.C.
T-18C92-X	22 Hy at 35 M.A. 405 ohms D.C.
T-14C61-X	7 Hy at 55 M.A. 200 ohms D.C.
T-14C62-X	8 Hy at 55 M.A. 250 ohms D.C.
T-14C63-X	8 Hy at 55 M.A. 300 ohms D.C.
T-14C64-X	10 Hy at 55 M.A. 350 ohms D.C.

TROPEX OUTPUT TRANSFORMERS

T-13S37-X	Single 6F6, 42, 2A5 etc. to voice coil
T-13S39-X	Single 45, 1-2A5 etc. to voice coil
T-13S40-X	P.P. 6F6, 42, 2A5 etc. to voice coil
T-33S99-X	P.P. 45, 71A, 43 etc. to voice coil
T-81S01-X	Class B 19, 1J6G, 30's etc. to voice coil
T-13S43-X	Single 1F4, 1D4, 1F5G etc. to voice coil
T-14S81-X	Single 6F6, 2A5 etc. or P.P. 45, 71A etc. to voice coil
T-14S82-X	Single 25L6 etc. to voice coil

TROPEX UNIVERSAL OUTPUT TRANSFORMERS

T-13S38-X	Any single tube or P.P. tubes to voice coil
T-57S01-X	
T-57S02-X	
T-13S41-X	
T-13S42-X	Any P.P. tubes to voice coil
	Any single tube to voice coil

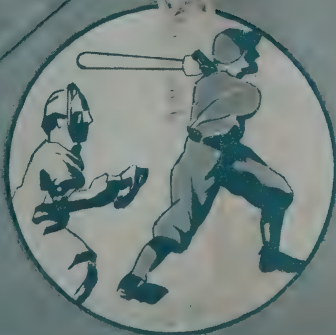
THORDARSON ELECTRIC MFG. COMPANY

500 West Huron Street, Chicago

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THORDARSON

AMPLIFIER GUIDE 346-D



Price 15c

Building Modern Amplifiers

By JEROME H. KLEKER

Chief Sales Engineer, Thordarson Electric Manufacturing Company

THE development of amplifiers is steadily progressing. Today the average builder can turn out a unit capable of results which a few years back could be obtained only in the laboratory. Improvements in tubes, transformers, and circuits make it possible to obtain higher power output from a comparatively small amplifier. Good frequency response is easily obtained and harmonic distortion can be held to the point where it is negligible.

The modern amplifier for Public Address must be entirely self contained. The gain must be high to accommodate low level microphones, and the hum level should be low especially where speakers with good low frequency response are used. The power output rating must be actual undistorted watts at all frequencies, and not just nominal or the tube manufacturers maximum output rating of the tubes used. The amplifiers described in this booklet are modern in these respects and incorporate numerous other improvements.

Thordarson engineers produced these amplifiers strictly for the Sound man and amplifier builder, taking into consideration the high standard of results which are always expected of custom built apparatus. Frequency response, power output, and distortion measurements were made periodically throughout their development on expensive laboratory equipment, thus insuring the most out of each amplifier complement. The final construction of the amplifier is reached only when each part is aiding in the superior performance of the unit.

Inverse feedback is used in most of the amplifiers because of the numerous advantages it offers. Distortion is reduced to minimum, frequency response is made more linear and the overall stability of the amplifier is improved. The constructor is urged to read each and every

article. The suggestions offered in the different models will aid in building any amplifier.

In order to facilitate construction, standard sized chassis are used wherever possible. These are nationally available from parts suppliers. Complete mechanical drawings showing socket and mounting holes make cut and try layout unnecessary and save considerable time in building an amplifier. If drills and punches are not available your local parts supplier may be able to do the necessary work for you.

Full size chassis templates for any amplifier are available from the factory for 15c postpaid. By using a full size drawing the chassis can be marked directly without measurement.

All parts listed are nationally advertised brands and are readily available. Substitution is recommended only when they are of equal quality and the electrical and physical characteristics are the same. Small hardware, etc., is not listed inasmuch as the builder usually has this material on hand.

Assembly of the amplifier is usually started by mounting tube sockets, controls, transformers, and chokes on the chassis. The bottom view photos are marked to indicate the placement of the more important parts used in the amplifier. Small bakelite strips with solder lugs were used in some cases to support small resistors and condensers. If the strips are not available, these parts may be self supported by their leads. The use of the strips, however, tend to make a neater and more rigid wiring job and are recommended.

Proceed to wire the amplifier by starting with the filament or heater circuits. No. 18 stranded pushback wire is suitable.

Wire the power supply next and finally the small resistors, condensers, and controls. It is quite important to use shielded wire as indicated in the circuit diagrams since hum and feedback is liable to result otherwise. Where the schematic diagrams show shielded resistors and condensers this is accomplished by first inserting the part in a piece of spaghetti tubing or wrapping with insulating material such as varnished cambric and then covering with shielding braid. The shielding of the parts so indicated is important in the reduction of hum.

After the assembly and wiring is completed recheck carefully before installing tubes and applying power. When certain that the wiring is correct the power can be applied and voltages checked carefully. It is advisable to measure all voltages and power output before the amplifier is placed in service. This will prevent overloading of tubes or parts due to improper adjustments, bad connections or oscillation.

Due to the high power sensitivity of beam power tubes they sometimes oscillate at a high inaudible frequency if placement of leads is not correct or shielding and grounds are insufficient. Oscillation can also be caused by improper phasing of the inverse feedback circuit. Reversal of the leads, connecting the feedback winding of the output transformer to the grid returns of the input transformer, will change the phase relationship of the feedback voltage. The use of an oscilloscope is recommended in determining when these conditions take place and in correcting same. The article on page 31 will be helpful in the proper testing of an amplifier with the oscilloscope.

Correspondence is invited to aid in the solution of your amplifier problems.

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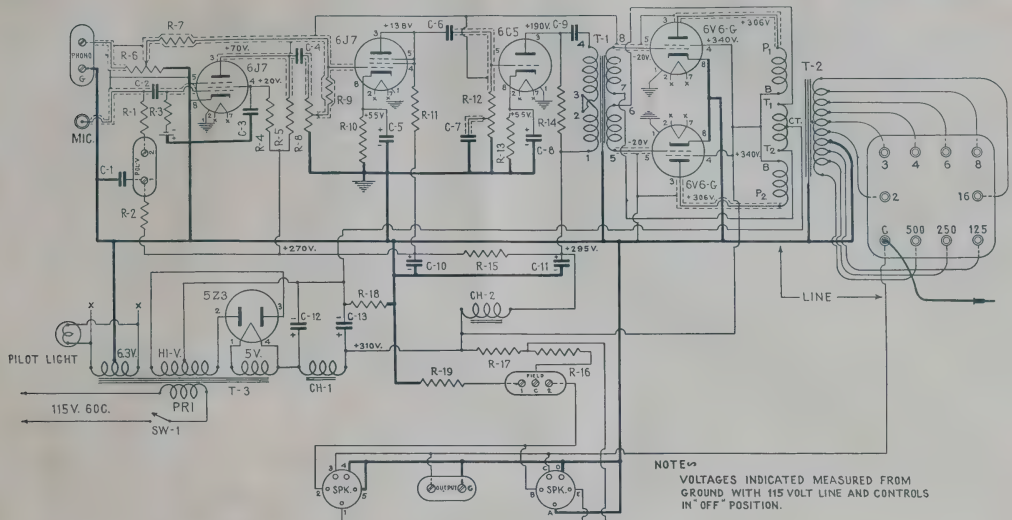
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15 WATT AMPLIFIER

THORDARSON



TECHNICAL DATA

Power Output: 15 watts undistorted or +34 db (less than 5% distortion).

Coverage: 200,000 to 500,000 cu. ft. indoors; 10,000 to 20,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

Input Circuits: One 5 megohm channel for high impedance crystal, dynamic, or velocity microphone, and one channel for high impedance crystal, or magnetic pick-up. The two channels may be mixed. Polarizing voltage is provided for static microphone or photo electric cell.

Field Supply: 10 watts available for one 5000 ohm field, or one or two 2500 ohm fields.

Output Impedances: 2, 3, 4, 6, 8, 16, 125, 250, or 500 ohms with CHT output transformer, or 4, 8, 15, 250, or 500 ohms with regular output transformer.

Frequency Response: Within ± 1 db from 40 c.p.s. to 15,000 c.p.s. with bass boost of 3.5 db below 100 c.p.s.

Tone Control: Maximum position attenuates 10,000 c.p.s. 28 db.

Gain: Microphone input 113 db; phono input 72 db (based on 100,000 ohms input impedance).

Hum: 74 db below maximum output.

Tubes: 2-6J7, 1-6C5, 2-6V6G, 1-5Z3.

Power Consumption: 112 Watts, 115 volts, 50-60 cycles.

Dimensions: 17" long, 10" deep, 9" high.

PARTS LIST

THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	CHT	REG	
T-1	T-15A74	T-15A74	Input Transformer
T-2	T-15S90	T-17S11	Output Transformer
T-3	T-15R06	T-70R62	Power Transformer
CH-1	T-15C54*	T-67C54	First Choke
CH-2	T-67C46	T-67C46	Second Choke

*Windings in parallel.

RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	10 MEG.	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-2	10 MEG.	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-3	5 MEG.	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-4	3 MEG.	1	IRC BT-1
R-5	500,000	1	IRC BT-1
R-6	1 MEG.	Volume Control	Yaxley type "O"
R-7	500,000	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-8	1 MEG.	Volume Control	Yaxley type "O"
R-9	500,000	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-10	5,000	1	IRC BT-1
R-11	100,000	1	IRC BT-1
R-12	500,000	Tone Control	Yaxley type "M"
R-13	1,000	1	IRC BT-1
R-14	20,000	1	IRC BT-1
R-15	20,000	1	IRC BT-1
R-16	2,500	25	Ohmite, Wirewound
R-17	1,500	25	Ohmite, Wirewound
R-18	125	25	Ohmite, Wirewound
R-19	2,500	25	Ohmite, Wirewound

TUBES

2	6J7
1	6C5
2	6V6-G
1	5Z3

Diagram No.	Mfd.	Voltage	Type
C-1	.1	400V Paper	Aerovox #484
C-2	.03	400V Paper	Aerovox #484
C-3	.04	400V Paper	Aerovox #484
C-4	.1	400V-Paper	Aerovox #484
C-5	10	25V Elect.	Cornell-Dubilier BR-102
C-6	.1	400V Paper	Aerovox #484
C-7	.03	400V Paper	Aerovox #484
C-8	10	25V Elect.	Cornell-Dubilier BR-102
C-9	.1	400V Paper	Aerovox #484
C-10, C-11	8-8	450 W. V. Elect.	Aerovox PBS-450
C-12	8	600V Elect.	Aerovox GL600
C-13	8	600V Elect.	Aerovox GL600

MISCELLANEOUS PARTS

1	10x17x3" chassis and cover—Par-Metal AF 1017
1	10x17" chassis bottom plate—Par-Metal BP 4526
1	4-contact socket — Amphenol S4
5	Octal sockets — Amphenol S8
2	5-contact sockets — Amphenol S5
2	5-prong speaker plugs — Amphenol PM5
1	Mic. connector — Amphenol PC1M
1	Mic. connector — Amphenol MC1P
1	Pilot light socket and jewel — Yaxley #310R
1	6.3V Pilot light — Masda #40
2	Metal tube grid caps
2	Metal grid cap shields
1	"Microphone" control plate
1	"Phono" control plate
1	"Tone" control plate
3	Control knobs
1	AC line cord & plug
1	Mallory bias cell — 1.5 V. — #F7
1	Mallory bias cell holder — #GB-1A
1	SPST switch — Arrow H & H #20992
3	Two screw terminal boards
1	Three screw terminal board

For complete mechanical drawing of chassis see page 28. Full size template of chassis available from ThorDarson. 15c net, postpaid.

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



THE use of inverse feedback makes it possible to obtain 25 watts of undistorted output from this amplifier with only 300 volts applied to the plates and screens of the power tubes. These low voltages increase tube and condenser life considerably which is a decided advantage. The output tubes are operated in a class AB1 circuit, under which condition no driving power is required; a single 6C5 tube supplies sufficient grid excitation through a C.H.T. input transformer. The windings of this transformer are balanced so that there is a cancelling effect for any hum that might be picked up. Degeneration or inverse feedback is obtained by coupling the tertiary winding of the output transformer to the secondary of the input transformer.

The input circuits are arranged to handle two high impedance microphones and a phono pick-up. Mixing takes place in the second stage in a resistor network that is more simple and economical than electronic mixing. Control action is smooth, and the changing of one control setting does not affect another. It is important, however, to shield resistors R-11, R-12, and R-13, and the leads as shown in the diagram. The impedance of these circuits is high, making them susceptible to hum pick-up and cross-talk unless adequately isolated.

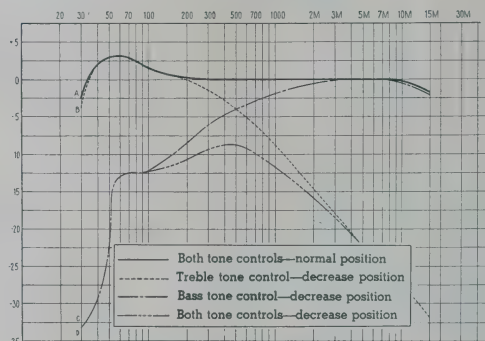
Frequency response is adjusted with two tone controls—one for bass and one for treble. With the tone controls in the normal position, the response of the amplifier is decidedly flat—from 30 to 15,000 cycles per second. There is approximately 3 db accentuation at 60 c.p.s. which is purposely brought about by resonating the primary of the input transformer with condenser C-13. This boost is desirable in radio and record reproduction and can be eliminated with the bass tone control for voice work if necessary. The adjustment of both controls helps eliminate feedback when bad acoustical conditions exist.

To insure good quality, loud speakers with a diameter of at least 12 inches are recommended. They should be capable of efficiently han-

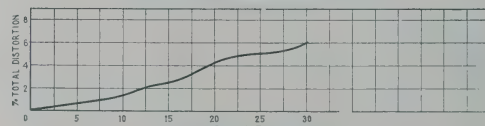
dling 15 watts of audio power each if the full 25 watt output of the amplifier is to be utilized. Either P M or electro-dynamic speakers are suitable since the amplifier will supply 18 watts for field excitation. This is adequate for one large speaker with a 5000 ohm field, or one or two smaller speakers with 2500 fields. A three-screw terminal board is provided for connecting a jumper wire in the event that P M speakers are used. Use table below in wiring the speaker plugs.

	Jumper	Connect to Prongs
1-5000 ohm field	none	1-5
1-2500 ohm field	C-2	2-5
2-2500 ohm field	none	B-E and 2-5
Field supply not used	1-C	

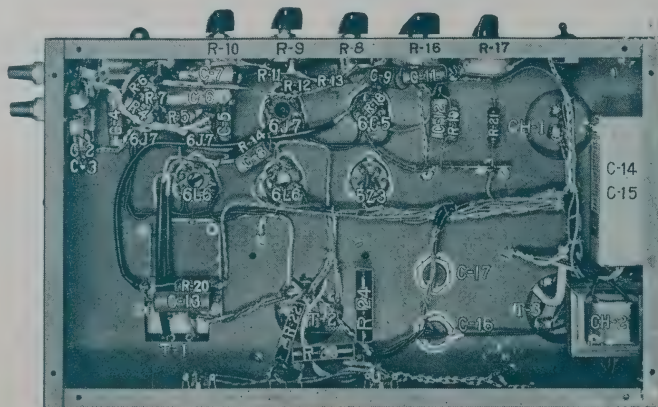
A polarizing voltage may be applied to the input connectors by connecting jumper wires on terminal board marked "POL. V." Refer to the 15 watt amplifier for further details on polarizing voltage for static microphones and photo electric cells.



FREQUENCY-RESPONSE CURVE



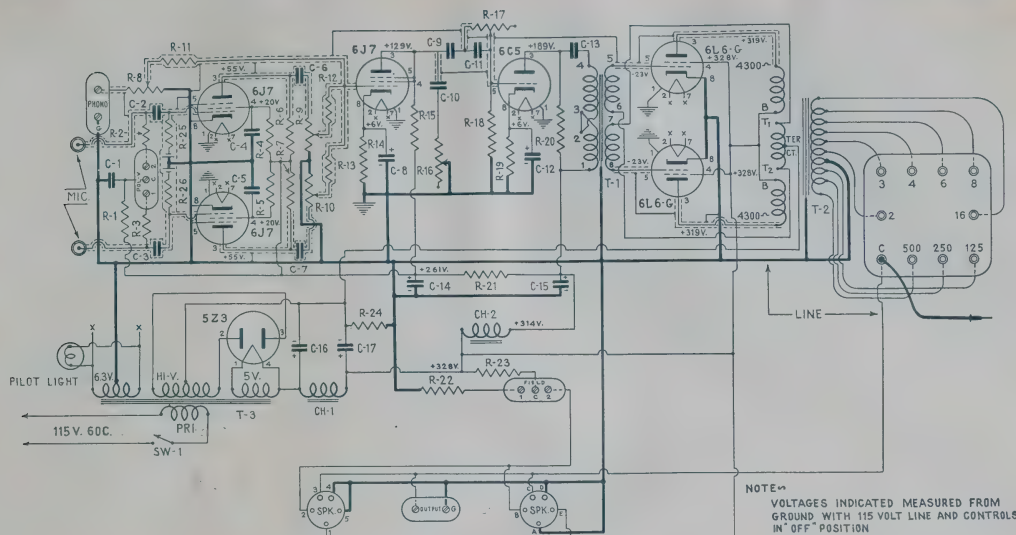
DISTORTION CURVE



BOTTOM VIEW



25 WATT AMPLIFIER



TECHNICAL DATA

Power Output: 25 watts undistorted or + 36.2 db (less than 5% distortion).

Coverage: 500,000 to 1,000,000 cu. ft. indoors; 20,000 to 30,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

Input Circuits: Two 5 megohm channels for high impedance crystal, dynamic, or velocity microphones, and one channel for high impedance crystal or magnetic pick-up. All channels can be mixed. Polarizing voltage is available for static microphone or photo electric cell.

Field Supply: 18 watts for one 5000 ohm field, or one or two 2500 ohm fields.

Output Impedances: 2, 3, 4, 6, 8, 16, 25, 250, or 500 ohms with CHT output transformer or 4, 8, 15, 250, or 500 ohms with regular output transformer.

Frequency Response: Within ± 1 db from 35 c.p.s. to 15,000 c.p.s. with bass boost of 3.5 db below 100 c.p.s.

Tone Controls: Two: bass control attenuates 12 db at 60 c.p.s.; treble control attenuates 27 db at 10,000 c.p.s.

Gain: Microphone input, 113 db; phono input 72 db (based on 100,000 ohms input impedance).

Hum: 74.5 db below maximum output.

Tubes: 3-6J7, 1-6C5, 2-6L6-G, 1-5Z3.

Power Consumption: 180 watts, 115 volts, 50-60 cycles.

Dimensions: 17" long, 10" deep, 9" high.

PARTS LIST

THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	CHT	REG.	
T-1	T-15A74	T-15A74	Input Transformer
T-2	T-15S91	T-17S12	Output Transformer
T-3	T-15R07	T-17R30	Power Transformer
CH-1	T-15C55*	T-67C49	First Choke
CH-2	T-67C46	T-67C46	Second Choke

*Windings in series.

RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	10 MEG.	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-2	10 MEG.	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-3	10 MEG.	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-4	3 MEG.	1	IRC BT-1
R-5	3 MEG.	1	IRC BT-1
R-6	500,000	1	IRC BT-1
R-7	500,000	1	IRC BT-1
R-8	250,000	Volume Control	Yaxley type "M"
R-9	1 MEG.	Volume Control	Yaxley type "O"
R-10	1 MEG.	Volume Control	Yaxley type "O"
R-11	500,000	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-12	500,000	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-13	500,000	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-14	5,000	1	IRC BT-1
R-15	100,000	1	IRC BT-1
R-16	500,000	Tone Control	Yaxley UC-513
R-17	9 MEG.	Tone Control	Yaxley UC-508
R-18	250,000	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-19	1,000	1	IRC BT-1
R-20	20,000	1	IRC BT-1
R-21	20,000	1	IRC BT-1
R-22	2,500	25	Ohmite Wire Wound
R-23	2,500	25	Ohmite Wire Wound
R-24	100	25	Ohmite Wire Wound,
			Tolerance $\pm 10\% - 0\%$
R-25	5 MEG.	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$
R-26	5 MEG.	$\frac{1}{2}$	IRC BT- $\frac{1}{2}$

TUBES

3	Type 6J7
1	Type 6C5
2	Type 6L6-G
1	Type 5Z3

CONDENSERS

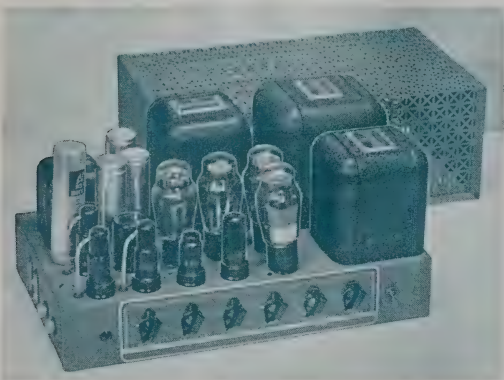
Diagram No.	Mfd.	Voltage	Type
C-1	.1	400V Paper	Cornell-Dubilier DT-4P1
C-2	.03	400V Paper	Cornell-Dubilier DT-4S3
C-3	.03	400V Paper	Cornell-Dubilier DT-4S3
C-4	.04	400V Paper	Cornell-Dubilier DT-4S4
C-5	.04	400V Paper	Cornell-Dubilier DT-4P1
C-6	.1	400V Paper	Cornell-Dubilier DT-4P1
C-7	.1	400V Paper	Cornell-Dubilier DT-4P1
C-8	10	25 V Elect.	Cornell-Dubilier BR-102
C-9	.1	400V Paper	Cornell-Dubilier DT-4P1
C-10	.03	400V Paper	Cornell-Dubilier DT-4S3
C-11	.001	600V Paper	Cornell-Dubilier DT-6D1
C-12	10	25 V Elect.	Cornell-Dubilier BR-102
C-13	.1	400V Paper	Cornell-Dubilier DT-4P1
C-14	8-8	450 WV Elect.	Cornell-Dubilier
C-15			EH-9808SL
C-16	8	600V Elect.	Aerovox GL600
C-17	8	600V Elect.	Aerovox GL600

MISCELLANEOUS PARTS

1	10x17x3" Chassis and cover — ICA #3875
1	10x17" Chassis bottom plate — ICA #4067
6	Octal sockets — Amphenol S8
1	4-contact socket — Amphenol S4
5	5-contact sockets — Amphenol S5
2	5-prong speaker plugs — Amphenol PM5
2	Mic. input connectors — Amphenol PC1M
2	Mic. input connectors — Amphenol MC1F
2	Three screw terminal boards
2	Two screw terminal boards
1	Pilot light socket and jewel — Yaxley 310R
1	6.3V Pilot light bulb — Mallory #F7
1	SPST toggle switch — Arrow H&H #20992
6	Control knobs
3	Metal tube grid cage
3	Metal grid cap shields
1	AC line cord and plug — Belden #1725
2	Bias cells, 1.5 volts — Mallory #F7
2	Bias cell holders — Mallory #GB-1A
2	"Mic" control plates
1	"Phono" control plates
1	"Tone" control plates (bass and treble)

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

For complete mechanical drawing of chassis see page 29. Full size template of chassis available from Thoradson, 15c net, postpaid.



THE characteristics of 6L6 beam power tubes are such that they may be used in the construction of amplifiers ranging from 5 to 60 watts output. Their power output depends on the class of operation employed, such as A₁, AB₁, AB₂. This is determined by the applied plate, screen and grid voltages, the plate load and driving power.

This 40 watt amplifier uses two 6L6-G tubes operating in class AB₂ with approximately 400 volts on the plates and 250 volts on the screens. Adequate driving power is supplied by a triode connected 6F6 tube through a CHT driver transformer. The use of inverse feedback and ample driving power make it possible to obtain 40 watts output without using fixed bias. This simplifies the construction of the amplifier considerably.

Two microphones and two phono pick-ups may be connected to the amplifier at one time. The two phono channels are especially desirable where dual turn-tables are employed for continuous record reproduction. Also a suitable radio tuner can be connected to one of the phono channels for broadcast reception in conjunction with one phono pick-up. Complete mixing makes possible the selection of one or more input channels for reproduction at the same time.

A dual tone control circuit recently developed in Thordarson's laboratory operates in the cathode circuit of the 6CS tube. One control affects only the low or bass frequencies, and the other controls the high or treble frequencies. Operation is such that with the controls in the center or vertical position the frequency response is normal, as illustrated by the frequency response curve. Turning the bass control to the left increases the bass response and to the right reduces it. The treble control functions in the same manner. More detailed description of this type of control and its effect on the amplifier frequency response is given on page 24.

Two 5Z3 rectifier tubes connected in a parallel circuit provide excellent power supply regulation. The additional tube also allows higher total current which is desirable for speaker field excitation. The amplifier supplies 25 watts for speaker fields, (250 volts at 100 MA) which is adequate for one large auditorium speaker or for two to four smaller speakers. The following table indicates how speaker field connections are made to the speaker sockets and the proper position of the field supply jumper wire.

Jumper	Connect to prongs
1 - 2500 ohm field	1-C
2 - 1250 ohm field	1-C
2 - 5000 ohm field	1-C
4 - 2500 ohm field	1-C
Field supply not used	C-2

*Connect two fields in parallel to each plug.

Make speaker voice-coil or line connections to contacts 3-4 and C-D of the speaker sockets or to the output terminal board. Impedance matching is accomplished by inserting the plug into the proper jack on the CHT output transformer terminal board.

TECHNICAL DATA

Power Output: 40 watts undistorted or +38.25 db (Less than 5% distortion).

Coverage: 1,000,000 to 2,000,000 cu. ft. indoors; 30,000 to 50,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

Input Circuits: Two high impedance channels for crystal, dynamic, or velocity microphones, and two high impedance phono channels for crystal or magnetic pick-ups. All four channels may be mixed.

Field Supply: 25 watts are available for one 2500 ohm, two 1250 ohm, two 5000 ohm, or four 2500 ohm fields.

Output Impedances: 2, 3, 4, 6, 8, 16, 125, 250 or 500 ohms with CHT output transformer or 4, 8, 15, 250 or 500 ohms with regular output transformer.

Frequency Response: Within ± 2 db, 30 to 15,000 c.p.s. (Tone controls in normal position).

Tone Controls: Two; Bass control varies response from +12 db to -35 db at 40 c.p.s. and treble control varies response from +8 db to -35 db at 7,000 c.p.s. from normal. It is possible to obtain practically any desired frequency response.

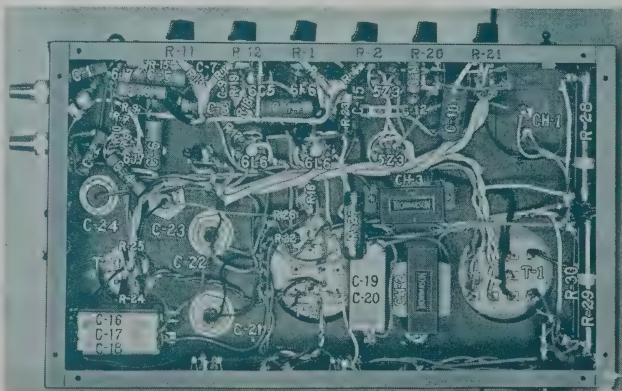
Gain: Microphone inputs, 118.5 db; phono inputs, 74 db (based on 100,000 ohms input impedance).

Hum: 75 db below maximum output.

Tubes: 2-6J7, 1-6F5, 1-6CS, 1-6F6, 2-6L6G, 2-5Z3.

Power Consumption: 220 watts, 115 volts, 50-60 cycles.

Dimensions: 17" long, 10" deep, 9" high.

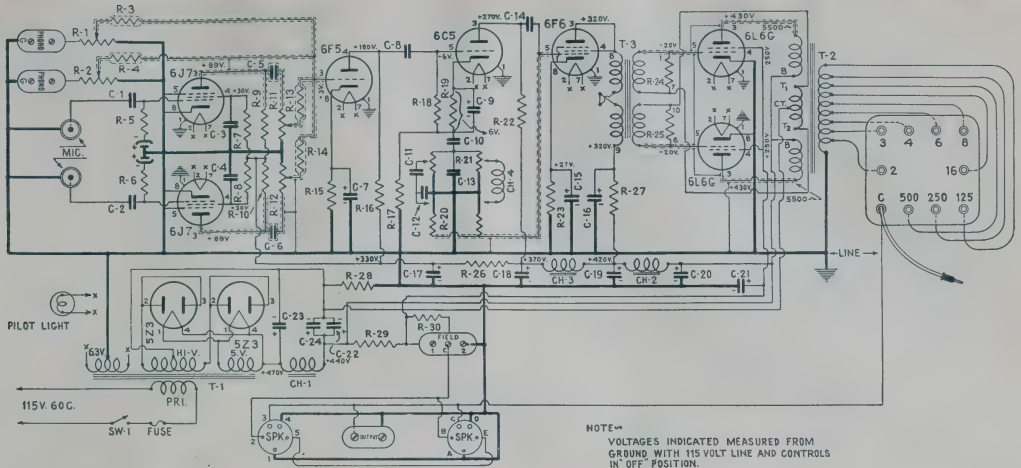


BOTTOM VIEW



40 WATT AMPLIFIER

THORDARSON
RADIO DIV.



PARTS LIST

THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	CHT	REG.	Type
T-1	T-15R08	T-17R31	Power Transformer
T-2	T-15S92	T-17S14	Output Transformer
T-3	T-15D85	T-15D85	Driver Transformer
CH-1	T-15C50*	T-75C51	First Choke
CH-2	T-18C92	T-18C92	Second Choke
CH-3	T-67C46	T-67C46	Third Choke
CH-4	T-14C70	T-14C70	Tone Control Choke

* Windings in series.

CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	.03	400V Paper	Aerovox #484
C-2	.03	400V Paper	Aerovox #484
C-3	.04	400V Paper	Aerovox #484
C-4	.04	400V Paper	Aerovox #484
C-5	.1	400V Paper	Aerovox #484
C-6	.1	400V Paper	Aerovox #484
C-7	.10	25V Elect.	Aerovox PR25
C-8	.1	400V Paper	Aerovox #484
C-9	.10	25V Elect.	Aerovox PR25
C-10	.05	400V Paper	Aerovox #484
C-11	.01	400V Paper	Aerovox #484
C-12	.01	400V Paper	Aerovox #484
C-13	.003	400V Paper	Aerovox #484
C-14	.1	400V Paper	Aerovox #484
C-15	.10	25V Elect.	Aerovox PR25
C-16, C-17	8-8	450V Elect.	Aerovox PBS450
C-18	8	450V Elect.	Aerovox PBS450
C-19	8	600V Elect.	Aerovox PBS600
C-20	8	600V Elect.	Aerovox PBS600
C-21	8	600V Elect.	Aerovox GL600
C-22	8	600V Elect.	Aerovox GL600
C-23	8	600V Elect.	Aerovox GL600
C-24	8	600V Elect.	Aerovox GL600

RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	500,000	Volume Control	Centralab N-103
R-2	500,000	Volume Control	Centralab N-103
R-3	500,000	1/4	Centralab #310
R-4	500,000	1/4	Centralab #310
R-5	5 Megohms	1/4	Centralab #310
R-6	5 Megohms	1/4	Centralab #310
R-7	3 Megohms	1/4	Centralab #310
R-8	500,000	1/4	Centralab #310
R-10	500,000	1/4	Centralab #310
R-11	1 Megohm	Volume Control	Centralab N-104
R-12	1 Megohm	Volume Control	Centralab N-104
R-13	500,000	1/4	Centralab #310
R-14	500,000	1/4	Centralab #310
R-15	5,000	1	Centralab #314
R-16	250,000	1/4	Centralab #310
R-17	20,000	1/4	Centralab #310
R-18	250,000	1/4	Centralab #310
R-19	1,000	1	Centralab #314
R-20	Special Dual Tone Control		ThorDARSON R-1068
R-21	Special Dual Tone Control		ThorDARSON R-1068
R-22	20,000	1	Centralab #314
R-23	900	10	Ohmite, Wirewound
R-24	10,000	1/4	Centralab #310
R-25	10,000	1/4	Centralab #310
R-26	20,000	1	Centralab #314
R-27	2,500	25	Ohmite, Wirewound
R-28	80	50	Ohmite, Wirewound
R-29	1,800	50	Ohmite, Wirewound
R-30	2,500	50	Ohmite, Wirewound

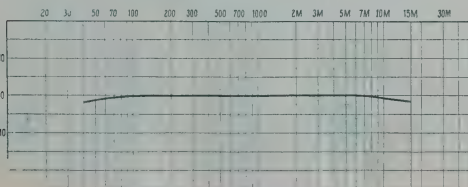
TUBES

2	Type 6J7
1	Type 6F5
1	Type 6C5
1	Type 6F6
2	Type 6LA-G
2	Type 6Z3

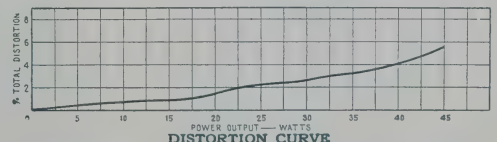
MISCELLANEOUS PARTS

1	10x17x3" Chassis and cover — ICA #3875
1	10x17" Chassis bottom plate — ICA #4067
2	5-Contact sockets — Amphenol S5
2	4-Contact sockets — Amphenol S4
7	Octal sockets — Amphenol S8
2	5-Prong speaker plugs — Amphenol FM5
3	Metal tube grid caps
3	Metal tube grid cap shields
1	Pilot light socket and jewel — Yaxley #310R
1	6.3V Pilot light bulb — Masda #40
1	SPST toggle switch — Arrow H&H #20992
2	Mic. input connectors — Amphenol #PCIM
2	Mic. input connectors — Amphenol #MCIF
1	Primary line cord and plug — Belden #1725
2	Bias cells, 1.5 volts — Mallory #F7
2	Bias cell holders — Mallory #GB-1A
2	"Mic." control plates
2	"Phono" control plates
2	"Tone" control plates
6	Volume control knobs
1	Fuse mounting — Littlefuse #1075
1	Fuse, 5 amp.
1	2-Screw terminal board, output
2	2-Screw terminal boards, phono input
1	3-Screw terminal board, field supply

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



FREQUENCY RESPONSE CURVE



DISTORTION CURVE

For complete mechanical drawing of chassis see page 29. Full size template of chassis available from THORDARSON 15c net, postpaid.



TOP VIEW

THIS 60 watt amplifier has sufficient undistorted power output for practically any loud speaker installation. Four type 6L6-G output tubes operate in a push-pull parallel class AB1 circuit. Under these conditions no driving power is required making it possible to use a single 6C5 tube for excitation of the power stage. Distortion in the power stage is reduced to a minimum by the use of inverse feedback. Laboratory tests of amplifiers without inverse feedback indicate that distortion at full output may be less than 5% at 400 c.p.s., however it may increase to as much as 30 to 46% at bass and treble frequencies. This peculiarity of pentode and tetrode power tubes is quite easily corrected by the use of inverse feedback. The output of this amplifier has less than 6% distortion at all frequencies between 30 and 10,000 c.p.s.

In wiring the amplifier, shield all leads in the grid and plate circuits of the output tubes. The schematic diagram indicates clearly where shielding is necessary. This should not be overlooked since shielding is important in modern amplifiers employing tubes with high power sensitivity. Connect the colored leads of the output transformer to the numbered terminals of T-3 as indicated in the diagram. If the leads of the tertiary winding are reversed oscillation is sure to result in the output stage.

Two rectifier tubes are used; one for the plate and bias voltages of the output stage; the other for the screens of the output tubes and the balance of the amplifier. The effect of this circuit is similar to fixed bias and also provides excellent screen voltage regulation which is essential for maximum undistorted output. Interstage coupling through the B supply is also eliminated, since the plate circuit of the 6L6-G tubes is supplied from a separate rectifier.

The amplifier as illustrated is constructed with regular Thordarson transformers and chokes except T-15A74. This is a Thordarson CHT input transformer which incorporates hum balancing construction, and a split secondary winding. The use of this transformer is essential since hum pick-up must be held to a minimum, and a split secondary is required for the inverse feedback connection. A CHT output transformer is also available as given in the parts list. In addition to having a better selection of secondary impedances the CHT output transformer is more efficient and has better frequency characteristics. Both the CHT and the regular output transformer have the 10% feedback winding.

A dual tone control circuit is used in the cathode circuit of the 6C5 tube. Since the control of frequencies is accomplished by means of degeneration, this stage provides very little gain. This stage therefore is strictly for tone control purposes. Refer to page 24 for more detailed information on this circuit and sketch showing connections to the special tone controls.

Both microphone circuits are susceptible to hum pick-up and "cross-talk" unless

properly shielded. A box may be formed from thin metal and placed as illustrated in the bottom view. Mount the bias cells, C-1, C-2, R-5, and R-6 on the inside wall of the chassis before fastening the metal box in place. Resistors R-3, R-4, R-13 and R-14 must also be shielded individually, as shown in the schematic drawing, to prevent hum and "cross-talk" from developing at this point.

TECHNICAL DATA

Power Output: 60 watts undistorted or +40 db (less than 6% distortion).

Coverage: 2,000,000 to 3,000,000 cu. ft. indoors, 50,000 to 75,000 sq. ft. outdoors, (depending on speaker efficiency and noise level).

Input Circuits: Two high impedance channels for crystal, dynamic, or velocity microphones, and two high impedance phono channels for crystal, or magnetic pick-ups. All channels may be mixed.

Output Impedances: 4, 8, 15, 250, or 500 ohms with regular output transformer as shown or 2, 3, 4, 6, 8, 16, 125, 250, or 500 ohms with CHT output transformer.

Frequency Response: Within ± 2 db from 40 to 15,000 c.p.s. (tone controls in normal position).

Tone Controls: Two; bass control varies response from +8 db at 70 c.p.s. to -30 db at 40 c.p.s., and treble control varies response from +9 db to -27 db at 7000 c.p.s. from normal. Practically any desired frequency response may be obtained.

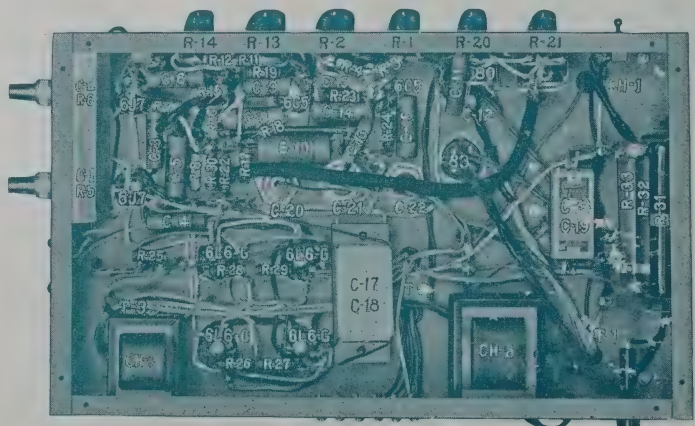
Gain: Microphone inputs, 112 db; phono inputs, 73 db (based on 100,000 ohms input impedance).

Hum: 75 db below maximum output.

Tubes: 3-6J7, 2-6C5, 4-6L6-G, 1-80, 1-83.

Power Consumption: 225 watts, 115 volts, 50-60 cycles.

Dimensions: 17" long, 10" deep, 9" high.

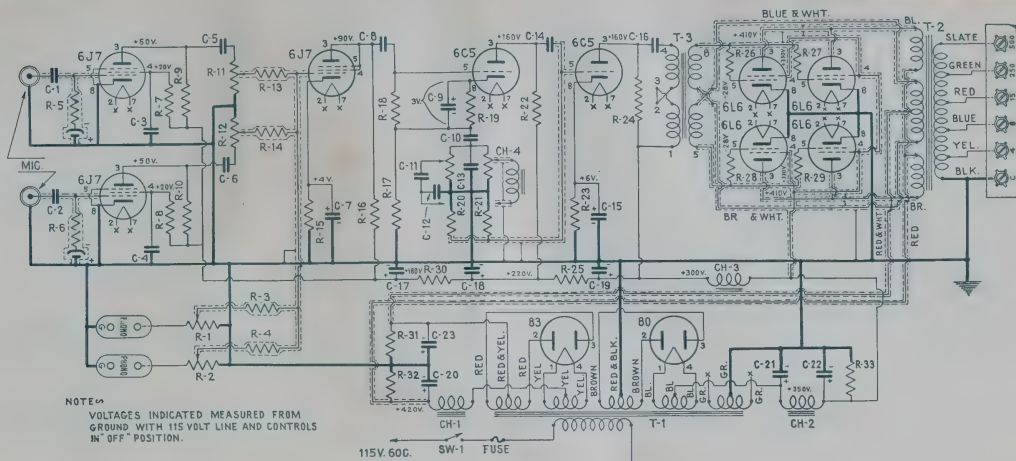


BOTTOM VIEW



60 WATT AMPLIFIER

THORDARSON



PARTS LIST

THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	Part
T-1	T-89R28 Power Transformer
T-2	T-17S15 or T-15S93 Output Transformer
T-3	T-15A74 Input Transformer
CH-1	T-76C51 Choke
CH-2	T-48C07 Choke
CH-3	T-67C46 Choke
CH-4	T-14C70 Tone Control Choke

CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	.03	400V Paper	Cornell-Dubilier #DT-4S3
C-2	.03	400V Paper	Cornell-Dubilier #DT-4S3
C-3	.04	400V Paper	Cornell-Dubilier #DT-4S4
C-4	.04	400V Paper	Cornell-Dubilier #DT-4S4
C-5	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-6	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-7	10	25V Elect.	Cornell-Dubilier #BR-102
C-8	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-9	10	25V Elect.	Cornell-Dubilier #BR-102
C-10	.5	400V Paper	Cornell-Dubilier #DT-4P5
C-11	.04	400V Paper	Cornell-Dubilier #DT-4S4
C-12	.003	600V Paper	Cornell-Dubilier #DT-6D3
C-13	.001	600V Paper	Cornell-Dubilier #DT-6D1
C-14	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-15	10	25V Elect.	Cornell-Dubilier #BR-102
C-16	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-17	8-8	450V Elect.	Aerovox PBS 450
C-18	8	450V Elect.	Aerovox PBS 450
C-19	8	450V Elect.	Aerovox GL600
C-20	8	450V Elect.	Aerovox GLS450
C-21	8	450V Elect.	Aerovox GLS450
C-22	8	450V Elect.	Aerovox GLS450
C-23	8	450V Elect.	Aerovox PBS 450

RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	1 MEG.	Volume Control	Centralab N-104
R-2	1 MEG.	Volume Control	Centralab N-104
R-3	500,000	1/4	Centralab #310
R-4	500,000	1/4	Centralab #310
R-5	5 MEG.	1/4	Centralab #310
R-6	5 MEG.	1/4	Centralab #310
R-7	3 MEG.	1/4	Centralab #310
R-8	3 MEG.	1/4	Centralab #310
R-9	500,000	1/4	Centralab #310
R-10	500,000	1/4	Centralab #310
R-11	1 MEG.	Volume Control	Centralab N-104
R-12	1 MEG.	Volume Control	Centralab N-104
R-13	500,000	1/4	Centralab #310
R-14	500,000	1/4	Centralab #310
R-15	1,000	1	Centralab #314
R-16	100,000	1	Centralab #314
R-17	20,000	1	Centralab #314
R-18	250,000	1/4	Centralab #310
R-19	2,000	1	Centralab #314
R-20	Dual Tone Control		ThorDARSON R-1068
R-21	Dual Tone Control		ThorDARSON R-1068
R-22	20,000	1	Centralab #314
R-23	1,000	1	Centralab #314
R-24	50,000	1	Centralab #314
R-25	20,000	1	Centralab #314
R-26	200	1	Centralab #314
R-27	200	1	Centralab #314
R-28	200	1	Centralab #314
R-29	200	1	Centralab #314
R-30	20,000	1	Centralab #314
R-31	125	50	Ohmite, Wirewound, +10%,-0%
R-32	40,000	50	Ohmite, Wirewound
R-33	10,000	25	Ohmite, Wirewound

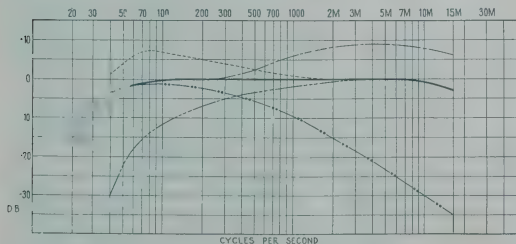
TUBES

3	Type 6J7
2	Type 6C5
4	Type 6L6-G
1	Type 80
1	Type 83

MISCELLANEOUS PARTS

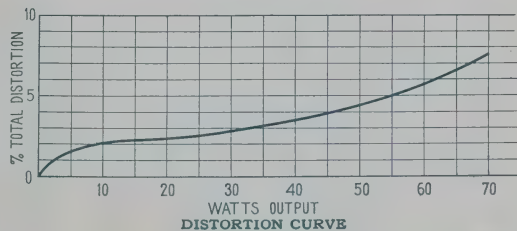
1	10x17x3" Chassis and cover — Bud #1127
1	10x17" Chassis bottom plate — Bud #689
9	Octal sockets — Amphenol S8
3	4-Contact sockets — Amphenol S4
2	Mic. input connectors — Amphenol PC1M
2	Mic. input connectors — Amphenol MC1F
1	6-Screw output terminal board
1	Fuse mounting — Littlefuse #1075
1	Fuse, 5 amp.
1	AC line cord and plug — Belden #1725
2	2-Screw terminal boards
1	Pilot light socket and jewel — Yaxley #310R
1	Pilot light, 6.3 volts — Mazda #40
1	SPST toggle switch — Arrow H&H #20992
3	Metal tube grid caps
3	Metal tube grid cap shields
2	"Mic" control plates
2	"Phono" control plates
2	"Tone" control plates
6	Control knobs
2	Bias cells, 1.5 volts — Mallory #F7
2	Bias cell holders — Mallory #GB-1A

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



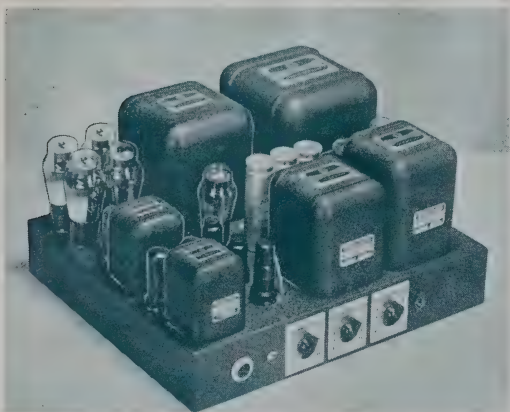
— Tone controls normal
 --- Bass increase — Treble normal
 ... Bass normal — Treble increase
 -.-.- Bass normal — Treble decrease
 --- Bass decrease — Treble normal

FREQUENCY RESPONSE CURVE



WATTS OUTPUT
DISTORTION CURVE

For complete mechanical drawing of chassis see page 30. Full size template of chassis available from THORDARSON 15c net, postpaid.



TOP VIEW

THE power output of this amplifier is adequate for the largest installations either indoors or out. The input circuit is arranged to operate from a pre-amplifier such as those described on pages 20 and 22. These pre-amplifiers have low impedance output transformers, making it possible to operate them several hundred feet from the 120 watt unit. A 500 ohm resistor (R-1) is connected across the input circuit of the 120 watt amplifier to match the 500 ohm output impedance of the pre-amplifier. This method is satisfactory since the 6J7 input tube provides approximately the same voltage gain as would be obtained from a line to grid transformer. Should it be desired to operate from a single high impedance pick-up without a pre-amplifier, resistor R-1 can be disconnected from the circuit. Under these conditions the amplifier gain is 90 db which is sufficient for full power output.

The second stage is the tone control and contributes very little to the overall gain of the amplifier. An article describing this tone control circuit may be found on page 24. If the tone control is not required, the 6C5 stage and associate parts can be eliminated without seriously affecting the gain of the amplifier.

A dotted line "A.....A" is shown on the circuit diagram just before the 6F6 driver tube grids. If the unit is to be used only as a booster amplifier, eliminate all those parts ahead of the dotted line. For connection to a 500 ohm line use a line to P-P grid transformer such as T-15A67 instead of T-15A74 as shown. The overall gain of the booster with this transformer is about 43 db. Therefore, full output will be obtained when a 0 db signal is fed to the unit (1.73 volts across 500 ohms).

Four type 6L6-G tubes operate in a push-pull parallel class AB2 circuit with inverse feedback. With this set-up it is possible to obtain maximum undistorted power output from beam power tubes. The driver stage consists of two 6F6 tubes connected as triodes. These provide excellent regulation which is essential when the output tube grids are driven positively.

It is necessary to shield the entire wiring of the final stage. This is easily done by using single shielded wire similar to that used for antenna lead in. Take care that the shielding does not come in contact with the tube socket contacts and other terminals. Ground all shielding carefully. If the amplifier oscillates interchange the leads connecting to terminals 7 and 6 on driver transformer T-4. This reverses the phase relationship of the feedback voltage with respect to the input voltage.

Two power supplies, entirely independent of one another, make it possible to obtain excellent regulation of the bias and screen voltages. The plate

supply of the output stage uses two type 83 rectifier tubes. An 80 is used to supply fixed bias and screen voltage to the output stage as well as plate voltage for the balance of the amplifier. A separate filter system for each supply isolates the output stage and insures stability. Resistors in series with the 83 tube plates help distribute the current evenly. These resistors are necessary when mercury vapor rectifier tubes are wired parallel.

Before operating the amplifier insert all tubes except the 83's and adjust R-26 until 24.5 volts are measured at the 6L6 grids. After the 83's are placed in the sockets turn the amplifier on and measure the bias voltage again. If any change is noted correct by adjusting R-26.

TECHNICAL DATA

Power Output: 120 watts or + 43 db (less than 8% distortion).

Coverage: Up to 5,000,000 cu. ft. indoors; 100,000 to 150,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

Input Circuit: Single channel; may be adapted to low or high impedance.

Output Impedances: 84, 100, 125, 166, 250 or 500 ohms; selected by plug and jacks on terminal board of CHT output transformer.

Frequency Response: Within ± 1 db from 40 to 15,000 c.p.s. (tone controls in normal position).

Tone Controls: Two; bass control varies response from + 7 db at 60 c.p.s. to -20 db at 30 c.p.s., and treble control varies response from +7.5 db to -20 db at 10,000 c.p.s. from normal. Practically any desired frequency response may be obtained.

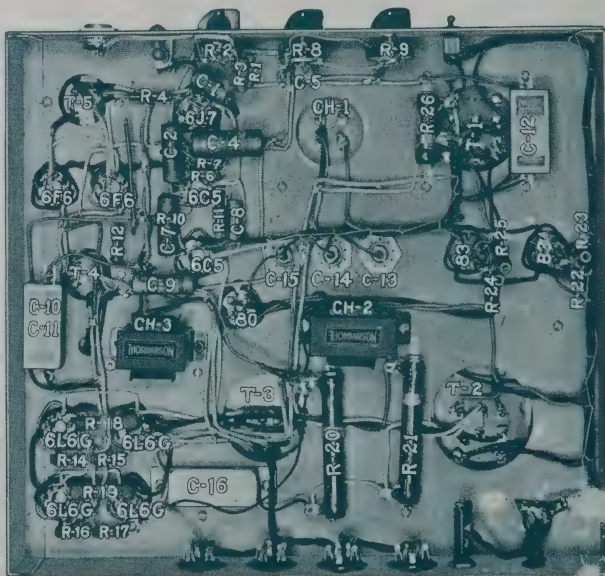
Gain: 90 db with high impedance input resistor (based on 100,000 ohms input impedance); 72.5 db with 500 ohm input resistor. (If line to grid transformer is used, gain is approximately 90 db.)

Hum: 73 db below maximum output.

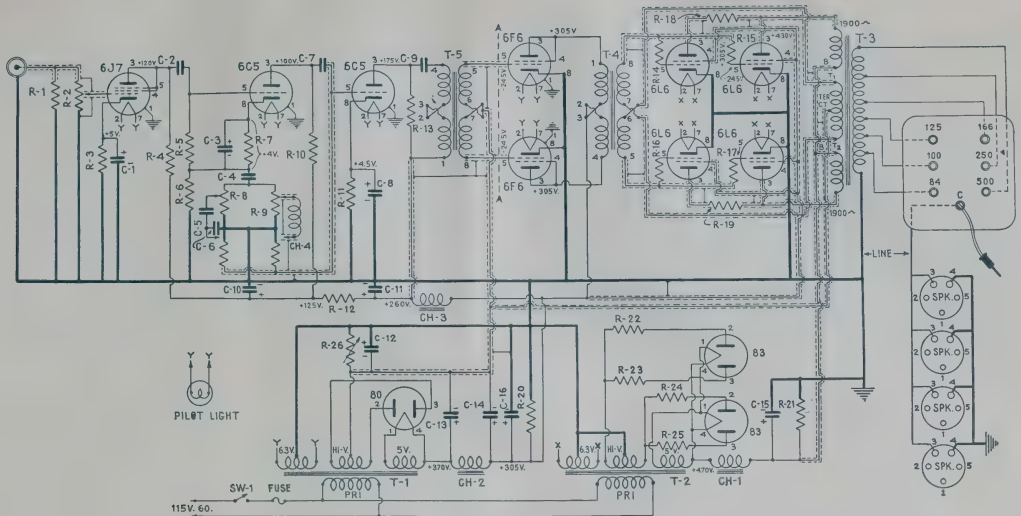
Tubes: 1-6J7, 2-6C5, 2-6F6, 4-6L6-G, 1-80, 2-83.

Power Consumption: 570 watts with no signal; 720 watts at maximum output.

Dimensions: 17" long, 15" deep, 9" high.



BOTTOM VIEW



PARTS LIST

THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	
T-1	T-15R06 Power Transformer
T-2	T-15R01 Power Transformer
T-3	T-15S94 Output Transformer
T-4	T-15D88 Driver Transformer
T-5	T-15A74 Input Transformer
CH-1	T-15C56 Choke*
CH-2	T-68C07 Choke
CH-3	T-67C46 Choke
CH-4	T-14C70 Tone Control Choke

*Winding in Series.

*Winding in Series.

CONDENSERS

Diagram	MW	Voltage	Type
C-1	10	25 V. Elect.	Cor.-Dub. #B-102
C-2	1	400 V. Paper	Cor.-Dub. #D-1T-4P2
C-3	10	25 V. Elect.	Cor.-Dub. B-102
C-4	5	400 V. Paper	Cor.-Dub. #D-1T-4P2
C-5	.04	400 V. Paper	Cor.-Dub. #D-4S4
C-6	.1	400 V. Paper	Cor.-Dub. #D-1T-4P2
C-7	.1	400 V. Paper	Cor.-Dub. #D-1T-4P2
C-8	10	25 V. Elect.	Cor.-Dub. #B-102
C-9	1	400 V. Paper	Cor.-Dub. #D-1T-4P2
C-10, C-11	8-8	450 V. Elect.	Cor.-Dub. #JR-588
C-12	18	200 V. Elect.	Cor.-Dub. #JR-216
C-13	8	600 V. Elect.	Aerovox #GL600
C-14	8	600 V. Elect.	Aerovox #GL600
C-15	8	600 V. Elect.	Aerovox #GL600
C-16	3	450 V. Elect.	Cor.-Dub. #JR-508

RESISTORS

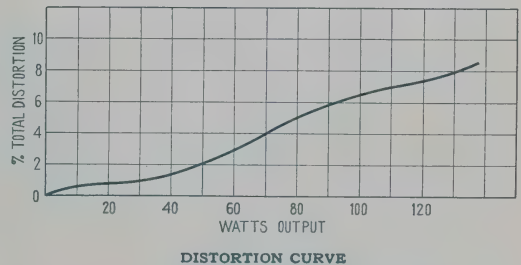
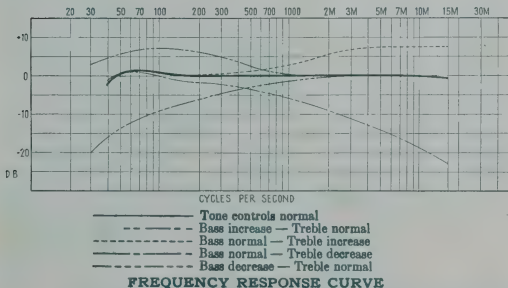
Diagram	Ohms	Watts	Type
R-1	500	1	Centralab #314
R-2	1 MEG.	Volume Control	Centralab N-104
R-3	5,000	1	Centralab #314
R-4	50,000	1	Centralab #314
R-5	250,000	$\frac{1}{2}$	Centralab #310
R-6	20,000	1	Centralab #314
R-7	1,000	1	Centralab #314
R-8	Dual Tone Control		Thordanson R-1068
R-9	Dual Tone Control		Thordanson R-1068
R-10	20,000	1	Centralab #314
R-11	100,000	1	Centralab #314
R-12	50,000	1	Centralab #314
R-13	20,000	1	Centralab #314
R-14	200	1	Centralab #314
R-15	200	1	Centralab #314
R-16	200	1	Centralab #314
R-17	200	1	Centralab #314
R-18	25	10	Ohmite, Wirewound
R-19	25	10	Ohmite, Wirewound
R-20	10,000	50	Ohmite, Wirewound
R-21	10,000	50	Ohmite, Wirewound
R-22	50	10	Ohmite, Wirewound
R-23	50	10	Ohmite, Wirewound
R-24	50	10	Ohmite, Wirewound
R-25	50	10	Ohmite, Wirewound
R-26	300	25	Ohmite, Semi-Var.

TUBES: 1-6J7, 2-6C5, 2-6F6, 4-6L6G, 1-80, 2-83

MISCELLANEOUS PARTS

- 1 17x5/32" Chassis with bottom plate
- 1 "Gain" control plate
- 2 "Tone" control plates
- 3 Volume control knobs
- 1 AC line cord and plug - Belden #1725
- 1 Fuse mounting - Littlefuse #1075
- 1 Fuse, 10 amperes
- 9 Cetal Sockets - Amphenol S8
- 3 4-Contact sockets - Amphenol S4
- 4 5-Contact sockets - Amphenol S5
- 1 5-Prong speaker plugs - Amphenol PM5
- 1 Input connector - Amphenol PC3F
- 1 Input connector - Amphenol MC3M
- 1 Pilot light socket and jewel - Yazley #310R
- 1 Pilot light bulb, 6.3 volts - Masda #40
- 1 Metal tube grid cap
- 1 Metal tube grid cap shield
- 1 SPST toggle switch - Arrow H&H #20992

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



For complete mechanical drawing of chassis see page 30. Full size template of chassis available from THORDARSON, 15c net, postpaid.



THIS 10-watt Tru-Fidelity audio amplifier, with volume expansion and dual tone control, will meet the requirements of the most discriminating listener. It is an improved version of the Thordarson 10-watt Tru-Fidelity unit, specially adapted to meet phonograph and radio tuner requirements. The amplifier features an unusually flexible tone control and volume expansion, making it possible to reproduce recordings with a high degree of naturalness. The volume expander is especially useful in restoring the range of symphonic renditions. No pre-amplifier stages are included as they are not needed and would materially increase the cost of construction.

With the bass and treble tone controls in "normal" position, the frequency response is flat. Through the use of the dual tone controls the bass may be boosted 7 db between 50 and 200 cycles or dropped 30 db from normal at 30 cycles. The treble may be boosted 9 db at 7000 or dropped 30 db at 10,000 cycles. These controls are independent, so any acoustical condition may be satisfied.

At the rated output of 10 watts, the distortion is but 3.7% and at 16 watts only 4.8%, which is still within high fidelity specifications.

The amplifier consists of five stages giving a gain of 70 db from either phono input (measured across a 100,000 ohm input). This gain is with the volume expansion off. When the expander is at maximum the volume level may be increased 11 db making a total overall gain of 81 db available. This is more than sufficient for any phono or tuner application.

Two phono inputs are mixed and fed into a 6C5 stage with a gain of 10. The output of this stage is fed into a 6L7, the gain of which varies according to the expansion voltage fed into it by the action of the 6C5-6H6 volume expansion stage. The energy for the expander stage is taken from the grid of the fourth stage 6C5.

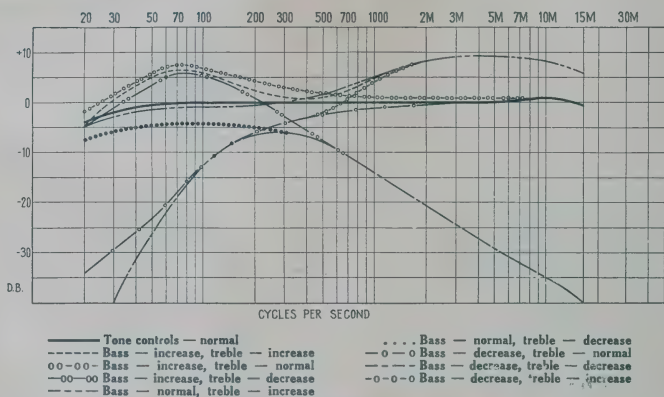
The output of the 6L7 is fed into a 6C5 tone control tube which has a gain of 1.4 with the controls in "normal" position. This in turn is fed into another 6C5 and then, through a T-90A04 Tru-Fidelity transformer, to two 2A3's or 6A3's in push pull. (The power

transformer has filament voltage available for either type tubes.) A Tru-Fidelity output transformer, T-90S13, makes voice coil or line impedances of 1.25, 3.75, 5, 7.5, 10, 15, 50, 125, 200, 250, 333 or 500 ohms available.

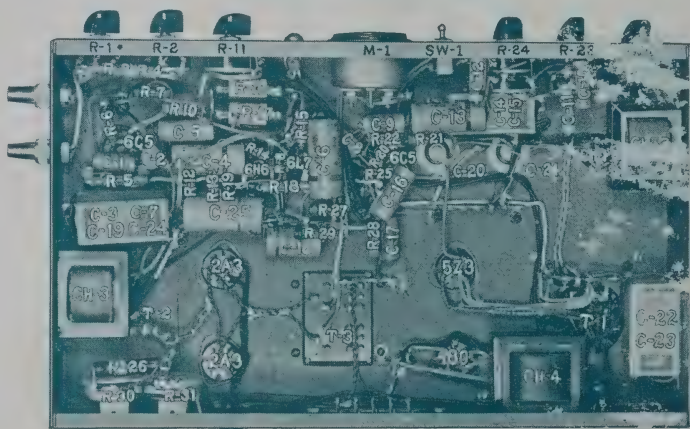
A form of degeneration is used in a new way to provide the unusually flexible tone compensating circuit shown. This circuit is so important and interesting that it is described in detail on page 24.

On the front panel are the two gain controls, near the input jacks; the expander control; a pilot light; the meter, with a switch at the far end of the chassis to measure the plate current of either or both output tubes; the on-off switch; the two tone controls and the plate current switch just mentioned.

In the photograph is shown the special shielding around the two small resistors from the gain controls. The circuit used results in a minimum of cross-talk, shielding them as shown removes the last possibility of it. Cover the resistors with cambric sleeving, then enclose them in a braid shield.



FREQUENCY-RESPONSE CURVE



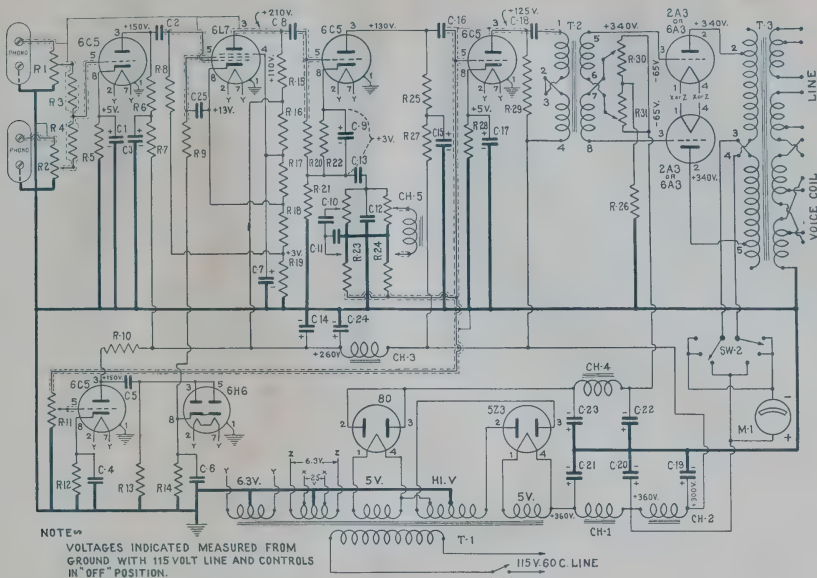
BOTTOM VIEW

For complete mechanical drawing of chassis see page 28. also, full size template available from Thordarson 15c net. postpaid



2A3 PHONO AMPLIFIER

THORDARSON
RADIO EQUIPMENT



TECHNICAL DATA

Power Output: 10 watts or + 32.2 db with 3.7% distortion; 16 watts or + 34.1 db with 4.8% distortion.

Input Circuits: Two high impedance phono channels for crystal or magnetic pick-up or radio tuner. Individual controls for mixing or fading.

Output Impedances: 1.25, 3.75, 5, 7.5, 10, 15, 50, 125, 200, 250, 333 or 500 ohms — selected by connecting output terminals to desired impedance of transformer.

Frequency Response: Within + 1 db from 20 to 15,000 c.p.s. (tone controls in normal position).

Tone Controls: Two: bass control varies response from + 7 db at 70 c.p.s. to -30 db at 30 c.p.s.; treble control varies response from -30 db to -30 db at 7,000 c.p.s.

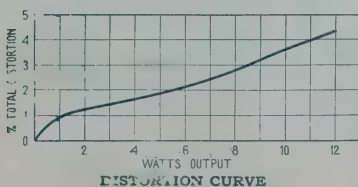
Volume: 20 db with volume expander "OFF"; 10 db with volume expander "ON".

Hum: 2 db below maximum output.

Tubes: 4-6C5, 1-6L7, 1-6H6, 2-2A3 or 6A3, 1-80, 1-5Z3.

Power Consumption: 140 watts, 115 volts, 50-60 cycles.

Dimensions: 17" long, 10" deep, 9" high.



THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	Description
T-1	T-15R05 Power Transformer
T-2	T-90A04 Audio Transformer
T-3	T-90S13 Output Transformer
CH-1	T-15C54* First Choke
CH-2	T-74C30 Second Choke
CH-3	T-67C48 Third Choke
CH-4	T-18C92 Bias Choke
CH-5	T-14C70 Tone Control Choke

*Winding in parallel.

RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	1 MEG.	Volume Control	Centralab N-104
R-2	1 MEG.	Volume Control	Centralab N-104
R-3	800,000	1/2	Centralab #310
R-4	500,000	1/2	Centralab #310
R-5	2,000	1	Centralab #314
R-6	20,000	1	Centralab #314
R-7	20,000	1	Centralab #314
R-8	1 MEG.	1/2	Centralab #310
R-9	500,000	1/2	Centralab #310
R-10	100,000	1	Centralab #314
R-11	1 MEG.	Volume Control	Centralab N-104
R-12	100,000	1/2	Centralab #310
R-13	100,000	1/2	Centralab #310
R-14	250,000	1/2	Centralab #314
R-15	100,000	1	Ohmite Brown Devil
R-16	10,000	10	Ohmite Brown Devil
R-17	10,000	10	Ohmite Brown Devil
R-18	800	1	Centralab #314
R-19	200	1	Centralab #314
R-20	250,000	1/2	Centralab #310
R-21	20,000	1	Centralab #314
R-22	1,000	1	Centralab #314
R-23	Dual Tone Control		Thordarson R1068
R-24	Dual Tone Control		Thordarson R1068
R-25	20,000	1	Ohmite Brown Devil
R-26	3,500	10	Centralab #314
R-27	50,000	1	Centralab #314
R-28	1,000	1	Centralab #314
R-29	50,000	1	Centralab #314
R-30	3,000	Potentiometer	Yaxley #C3MP
R-31	3,000	Potentiometer	Yaxley #C3MP

TUBES

4	Type 6C5
1	Type 6L7
1	Type 6H6
2	Type 2A3 or 6A3
1	Type 80
1	Type 5Z3

PARTS LIST

CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	10	25 V. Elect.	Cor.-Dub. #BR-102
C-2	1	400 V. Paper	Aerovox #484
C-3, C-7	5-8	450 WV. Elect.	Aerovox PBS 450
C-4	.5	400 V. Paper	Aerovox #484
C-5	.1	400 V. Paper	Aerovox #484
C-6	.5	400 V. Paper	Aerovox #484
C-8	1	400 V. Paper	Aerovox #484
C-9	10	25 V. Elect.	Cor.-Dub. #BR-102
C-10	.03	400 V. Paper	Aerovox #484
C-11	.03	400 V. Paper	Aerovox #484
C-12	.002	400 V. Paper	Aerovox #484
C-13	.5	400 V. Paper	Aerovox #484
C-14, C-15	8-8	450 WV. Elect.	Aerovox PBS 450
C-16	.1	400 V. Paper	Aerovox #484
C-17	10	25 V. Elect.	Cor.-Dub. #BR-102
C-18	.25	400 V. Paper	Aerovox #484
C-19, C-24	8-8	450 WV. Elect.	Aerovox PBS 450
C-20	8	450 V. Elect.	Aerovox G 450
C-21	8	450 V. Elect.	Aerovox G 450
C-22, C-23	8-8	450 WV. Elect.	Aerovox PBS 450
C-25	.5	400 V. Paper	Aerovox #484

MISCELLANEOUS PARTS

1	10x17x8" Chas. and screen cover—Par-Metal #AF1017
1	0-150 MA DC meter — Triplets #229
1	SPST toggle switch — Arrow H&H #20092
1	Two gang three position switch — Yaxley #3223-J
6	Octal sockets — Amphenol S8
4	4-Contact sockets — Amphenol S4
1	Metal tube grid cap
1	Metal tube grid cap shield
2	"Volume" control plates
2	"Tone" control plates
1	"Expansion" control plate
1	Three position meter switch plate
6	Control knobs
2	Mic. connectors — Amphenol PC1M
2	Mic. connectors — Amphenol MC1F
1	AC line cord and plug — Belden #1725
1	Pilot light socket and jewel — Yaxley J310R
1	Pilot light bulb, 6.3 volts — Mazda #40
2	Brackets—Yaxley RB #248

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



TOP VIEW

The combination 6 volt D.C., 115 volt A.C. amplifier has become very popular, especially in mobile public address work. Its flexibility permits operation almost anywhere that a 6 volt storage battery can be placed, such as rural gatherings, picnics, beach parties, motor boats, barn dances, etc. It is the ideal unit for portable and rental work since the undistorted power output of 20 watts is sufficient for most installations. Results are alike on both battery and 115 volt A.C. supplies with no sacrifice in the quality of reproduction.

The amplifier is similar to the 25 watt unit described on page 8; two 6L6-G's operate in a class AB₁ circuit with approximately 300 volts applied to the plates and screens. Inverse feedback reduces the distortion which is lower than ordinarily encountered in 6 volt amplifiers of this type. Two input channels accommodate a low level high impedance microphone and high impedance phono pick-up. The gain of the amplifier is more than adequate for full output with either "Mic" or "Phono".

Operation from 6 volts D.C. is made possible by incorporating a heavy duty vibrator to convert the D.C. into alternating current. Dual operation is accomplished by having both a 6 volt vibrator primary and a 115 volt primary on one and the same transformer. Two 6W5-G tubes rectify the high voltage for both battery and A.C. operation. A 6.3 volt secondary on the transformer supplies the heater current for A.C. operation only. The heaters are switched to the battery automatically for 6 volt operation by inserting the proper power supply plug. Two plugs are used, one being wired for 115 volt and the other for 6 volt operation. These plugs are wired as indicated on the schematic diagram.

Three switches are required. Two are used for 6 volt operation, one being a heavy duty type which controls the total 6 volt supply and the other is connected in the vibrator circuit and provides standby operation. The third is the "On" and "Off" switch for operation from 115 volts A.C.

When operating from a 6 volt

battery, turn the main heavy duty switch "On" first and wait a minute or so for the tube heaters to warm up before turning on the vibrator switch. The vibrator switch controls the "B" supply and when turned "On" the battery drain increases from 4.5 amperes (which is the heater current) to about 19 amperes. This switch is a desirable feature since the battery can be conserved without waiting for the heaters to warm up when operation is desired.

All converters, whether rotary or the vibrator type, develop a certain amount of high frequency hash. This disturbance is easily picked up in the amplifier circuit unless proper isolation and shielding is employed. Therefore, it is advisable to construct the amplifier as closely as possible to the illustrations and diagram. All shielding should be incorporated where shown. A small metal box is formed and fastened in place by the Amphenol connector PC1M. One side of the box is left open to tighten the connector and insert C1, R1, and the bias cell and holder. Pass a shielded lead through the small hole for the 6J7 grid connection. Wire the lead and parts and test the amplifier before soldering the box side in place.

TECHNICAL DATA

Power Output: 20 watts undistorted or 35.5 db (less than 5% distortion).

Coverage: 500,000 to 1,000,000 cu. ft. indoors; 15,000 to 25,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

Input Circuits: One 5 megohm channel for high impedance crystal, dynamic or velocity microphone, and one channel for high impedance crystal or magnetic pick-up. Channels may be mixed and faded.

Output Impedances: 4, 8, 15, 250, or 500 ohms with regular transformer, or 2, 3, 4, 6, 8, 16, 125, 250, or 500 ohms with CHT output transformer.

Frequency Response: Within ± 2 db from 50 to 8,000 c.p.s. with bass boost of 5 db at 70 c.p.s.

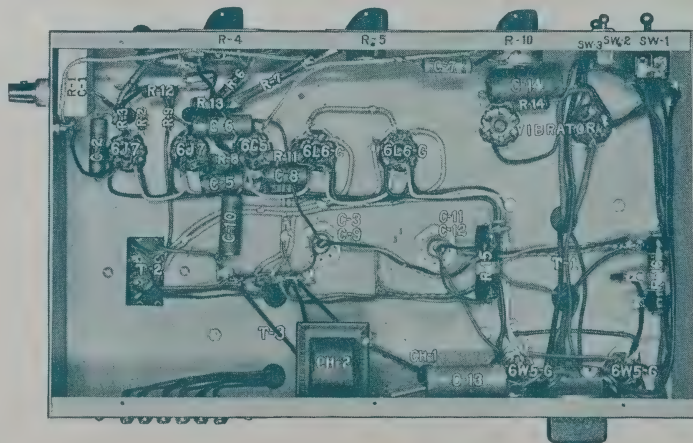
Gain: Microphone input, 114 db; phono input, 75 db (based on 100,000 ohms input impedance).

Hum: 70 db below maximum output.

Tubes: 2-6J7, 1-6C5, 2-6L6-G, 2-6W5-G.

Power Consumption: 100 watts at 115 volts, 50-60 cycles, or 19 amps. at 6V. D.C. (4.5 amperes on standby position).

Dimensions: 17" long, 10" deep, 9" high.

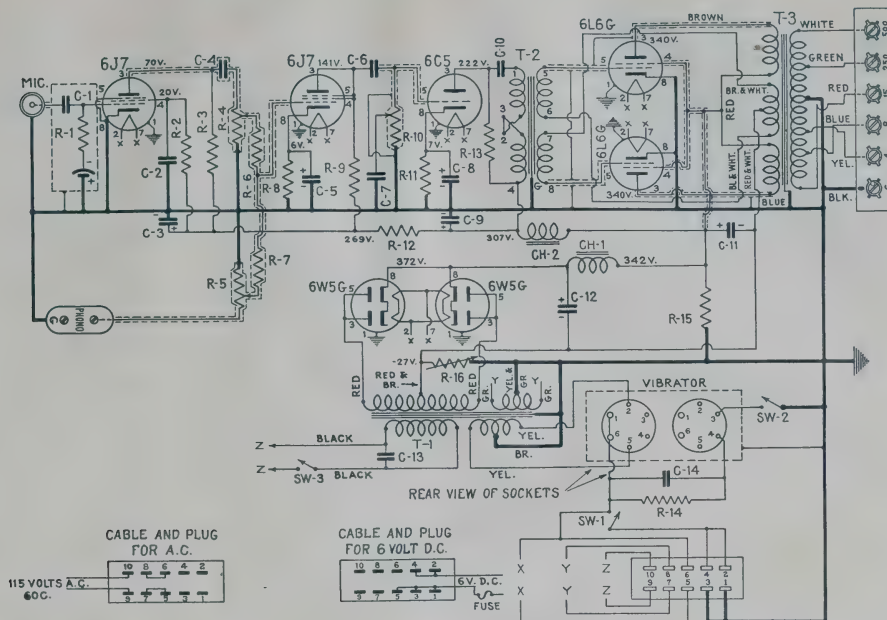


BOTTOM VIEW



6 Volt DC - 115 Volt AC AMPLIFIER

THORDARSON



PARTS LIST

THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	Transformer	Type
T-1	T-14R40	Power Transformer
T-2	T-15A74	Input Transformer
T-3	T-17S12 or T-15S91	Output Transformer
CH-1	T-17C00-B	First Choke
CH-2	T-37C38	Second Choke

RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	5 MEG.	1/2	Centralab #310
R-2	3 MEG.	1/2	Centralab #310
R-3	500,000	1/2	Centralab #310
R-4	1 MEG.	1	Centralab #N-104
R-5	1 MEG.	1	Centralab #N-104
R-6	100,000	1/2	Centralab #310
R-7	500,000	1/2	Centralab #310
R-8	5,000	1	Centralab #314
R-9	100,000	1/2	Centralab #310
R-10	500,000	1	Centralab #N-103
R-11	1500	1	Centralab #314
R-12	20,000	1	Centralab #314
R-13	20,000	1	Centralab #314
R-14	200	1	Centralab #314
R-15	25,000	25	Ohmite Wire Wound
R-16	300	25	Ohmite Semi-Variable

CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	.03	400V Paper	Aerovox #484
C-2	.04	400V Paper	Aerovox #484
C-3	8-8	450V Dual Elect.	Aerovox #2GL450
C-4	.1	400V Paper	Aerovox #484
C-5	10	25V Elect.	Cornell-Dubilier BR-102
C-6	.1	400V Paper	Aerovox #484
C-7	.01	400V Paper	Aerovox #484
C-8	10	25V Elect.	Cornell-Dubilier BR-102
C-9	.1	400V Paper	Aerovox #484
C-10	8-8	450V Dual Elect.	Aerovox #2GL450
C-11	.03	400V Paper	Aerovox #484
C-12	.04	400V Paper	Aerovox #484
C-13	.05	200V Paper	Aerovox #284
C-14	.5	200V Paper	Aerovox #284

MISCELLANEOUS PARTS

1	10x17x3" Chassis and cover — ICA #3875
1	10x17" Chassis bottom plate — ICA #4067
7	Octal sockets — Amphenol S8
2	6-contact socket — Amphenol S6
1	Mic. input connector — Amphenol PC1M
1	Mic. input connector — Amphenol MC1F
1	Six screw output terminal board
1	Two screw phono input terminal board

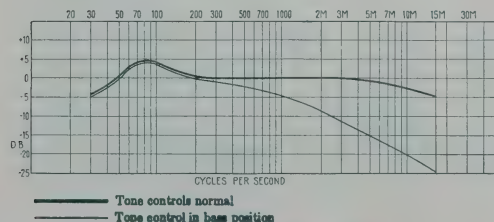
MISCELLANEOUS PARTS (Continued)

1	AC line cord and plug
1	Jewel and Bracket — Yaxley #310R
1	6.3 volt pilot light — Madsa #40
2	SPST Toggle switches — Arrow H&H #20992
1	DPST Toggle switch — 6 v 25 amp. — C-H #8244
2	Metal tube grid caps
2	Metal tube grid shields
3	Control knobs
3	Control plates
2	10-contact power plugs — H. B. Jones #S-310-FHT
1	10-contact power plug — H. B. Jones #P-310-CB
1	Vibrator — Electronics #490
1	Bias cell — 1.5 volts — Mallory #F7
1	Bias cell holder — Mallory #GB-1A
1	pc. tinned copper — 62x.010"
1	30 amp fuse
1	Fuse holder for 30 amp fuse
2	Battery clips 50 amp capacity

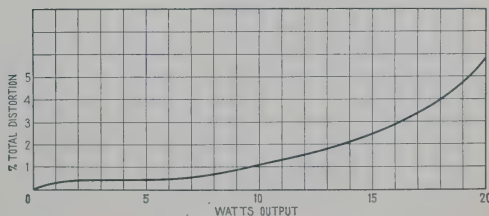
Battery Cable: #10 stranded wire, rubber covered.
Tube Complement: 2-6J7, 1-6C5, 2-6L6-G, 2-6W5-G

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

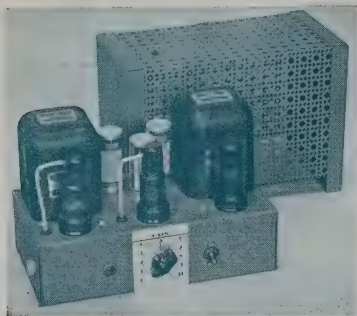
FOR MECHANICAL DRAWING OF CHASSIS SEE PAGE 27



FREQUENCY-RESPONSE CURVE



DISTORTION CURVE



TOP VIEW

ALTHOUGH pre-amplifiers are not as popular as they were some years back, there are cases where their use is recommended or necessary. The sound installation which requires that the microphone be located several hundred feet or more from the main power amplifier, can make good use of a pre-amplifier of the type shown on these pages. The gain is about 60 db, which will raise the level of the average low level microphone to approximately 0 db. Its output impedances are 500, 333, 250, 200, 125 or 50 ohms. The 500 or 200 ohm impedances are most commonly used. When a line operates under these conditions, any hum or disturbance which is picked up is so far below the signal level that it is not objectionable in the output of the loud speakers. High impedance microphones, such as the crystal, velocity and dynamic, should not be used at distances greater than 50 to 100 feet without such a pre-amplifier. When this distance is exceeded, losses occur either in signal level or frequency response.

This single channel amplifier is entirely self-contained, and operates from 115 volts 60 cycle current. It can be used in conjunction with the 120 watt amplifier described on page 14 or any of the amplifiers described in the Amplifier Guide, if the proper input impedance is built into the amplifier. Best results are obtained when a high quality hum balancing transformer having a 200 or 500 ohm primary is placed in the phono circuit of the amplifier. Thoradson T-90A00 or T-15A66 is suitable for this purpose. Best results are obtained when the gain control on the pre-amplifier is almost all the way on and that on the main amplifier cut down to control the output of the system.

The assembly and wiring of the pre-amplifier is quite simple; however, care should be taken in placing and wiring those parts enclosed in the dotted line on the schematic

diagram. Condenser C-1 and resistors R-1 and R-2 may require shielding if hum is to be cut to a minimum. It is recommended that the chassis be provided with a base to fully enclose the bottom of the pre-amplifier. Where no base is used, it may be necessary to shield all those parts included in the above mentioned dotted line.

The output transformer T-2 is shown connected to a five-contact socket. The connections indicated provide coupling to either a 200 or 500 ohm line. The additional impedances are obtainable by properly connecting the secondary of the transformer. Full instructions are supplied with each transformer for obtaining these other impedances.

TECHNICAL DATA

Output Level: 0 db or .006 watts (less than 1% distortion).

Gain: 59.9 db (based on 100,000 ohm input impedance).

Frequency Response: Within ± 1 db from 30 to 15,000 c.p.s.

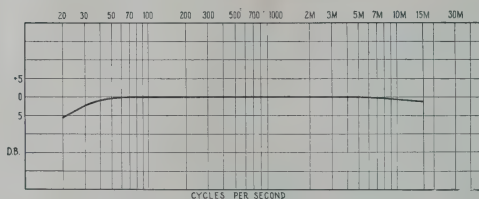
Input: 5 megohms for one high impedance crystal, dynamic, or velocity microphone.

Output: Low impedance line — 500, 333, 250, 200, 125, or 50 ohms.

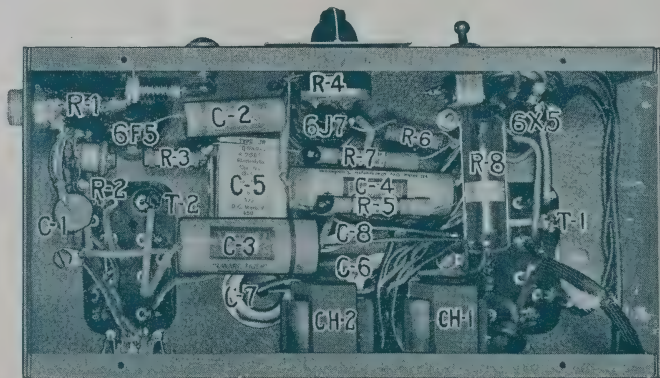
Tubes: 1-6F5, 1-6J7, 1-6X5.

Power Consumption: 17.5 watts, 115 volts, 50-60 cycles.

Dimensions: 9 $\frac{1}{2}$ " long, 5" deep, 6" high — with cover 8 $\frac{1}{2}$ " high.



FREQUENCY-RESPONSE CURVE

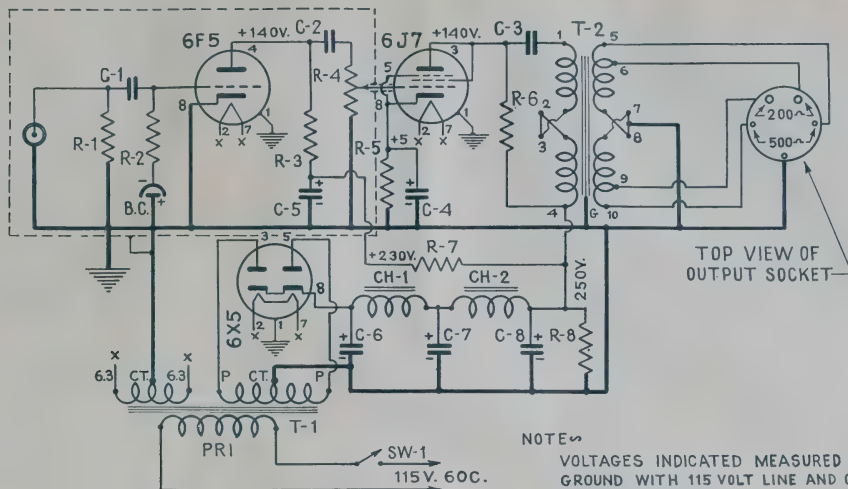


BOTTOM VIEW



SINGLE CHANNEL PRE-AMPLIFIER

THORDARSON
BUILT IN THE U.S.A.



PARTS LIST

THORDARSON TRANSFORMERS AND CHOKES

Diagram

No.	
T-1	T-15R04 Plate and Filament Transformer
T-2	T-15A71 Tube to Line Transformer
CH-1	T-13C26 Choke
CH-2	T-13C26 Choke

Diagram

No.	Ohms	Watts	Type
R-1	5 MEG.	1/2	IRC BT-1/2
R-2	5 MEG.	1/2	IRC BT-1/2
R-3	100,000	1	IRC BT-1
R-4	250,000	1	Yaxley type "M"
R-5	2,000	1	IRC BT-1
R-6	50,000	1	IRC BT-1
R-7	20,000	1	IRC BT-1
R-8	50,000	10	Ohmite Brown Devil

Diagram

No.	Mfd.	Voltage	Type
C-1	.1	400 V Paper	Cornell-Dubilier #DT-4P1
C-2	.1	400 V Paper	Cornell-Dubilier #DT-4P1
C-3	.5	400 V Paper	Cornell-Dubilier #DT-4P5
C-4	10	25 V Elect.	Cornell-Dubilier #ED-2100
C-5	8	450 V Elect.	Cornell-Dubilier #JR-508
C-6	8	450 V Elect.	Cornell-Dubilier #KR-508
C-7	8	450 V Elect.	Cornell-Dubilier #KR-508
C-8	8	450 V Elect.	Cornell-Dubilier #KR-508

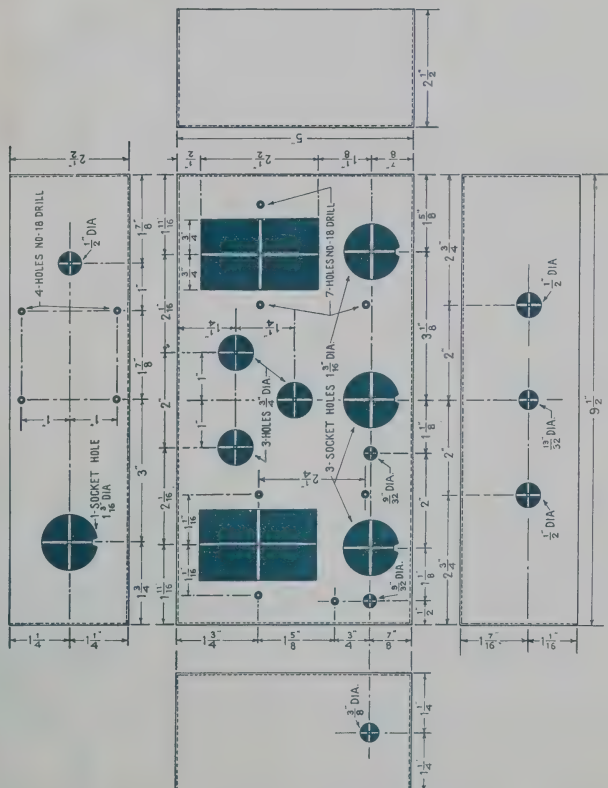
TUBES

1	Type 6F5
1	Type 6J7
1	Type 6X5

MISCELLANEOUS PARTS

1	5x9 1/2x2 1/4" Chassis and cover — Bud No. 699
1	5x9 1/2" Chassis bottom plate — Bud No. 680
3	Octal sockets — Amphenol S8
1	Output socket — Amphenol S5
1	Output plug — Amphenol PM5
1	Mic. input connector — Amphenol MC1F
1	Mic. input connector — Amphenol PC1M
2	Metal tube grid caps
2	Metal tube grid cap shields
1	AC line cord & plug — Belden No. 1725
1	SPST switch — Arrow H&H No. 20992
1	Volume control knob, black
1	Volume control dial plate
1	Pinch hit bracket and jewel — Yaxley No. 310R
1	Bias cell, 1.5 Volts — Mallory No. F7
1	Bias cell holder — Mallory No. GB-1A
1	Pilot light bulb, 6.3 volts — Maxida No. 40

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitation prohibits.



Chassis drawing of Single Channel Pre-Amplifier. Full size template available from THORDARSON, 15c net, postpaid.



TOP VIEW

THE multiple channel pre-amplifier and mixer is useful where more input circuits must be accommodated than the regular amplifier will handle. Most main amplifiers accommodate only one or two microphones. Like the single channel pre-amplifier on the previous page, this unit may be operated several hundred feet from the main amplifier if necessary without serious loss of volume level or frequency response. The main amplifier should be equipped with a 200 ohm or 500 ohm input transformer to match the output impedance of the pre-amplifier. Thordarson transformers T-90A00 or T-15A66 are suitable for this use. The 120 watt amplifier on page 14 is designed to operate with a pre-amplifier and mixer of this type.

The circuit diagram as shown will accommodate four low level high impedance microphones. If it is preferable to handle only three low level microphones and a phono pick-up, one of the 6F5 pre-amplifier tubes and associated parts can be eliminated. The phono pick-up will then operate directly into volume control R-16. Likewise, two pre-amplifier tubes can be eliminated if two phono pick-up channels are more desirable.

Dotted lines are shown on the circuit diagram indicating that portion of the circuit which is susceptible to hum and noise pick-up. In the laboratory model, it was necessary to shield resistors R-17, R-18, R-19, and R-20 and all the leads connecting

to them as well as the grid leads to the 6F5 tubes. Additional shielding should not be necessary if the chassis is fully enclosed with a chassis bottom plate. Bias cells provide bias for the 6F5 input tubes, thus eliminating any disturbance that might develop in the cathode circuit of these tubes.

TECHNICAL DATA

Output Level: 0 db or .006 watts (less than 1% distortion).

Gain: 55 db (based on 100,000 ohm input impedance).

Frequency Response: Within ± 2 db from 20 to 15,000 c.p.s.

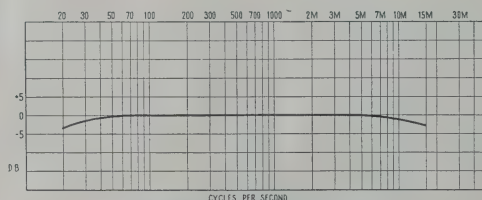
Input Circuits: Four 5 megohm channels for high impedance crystal, dynamic or velocity microphones.

Output: Low impedance line — 500, 333, 250, 200, 166, 125, or 50 ohms.

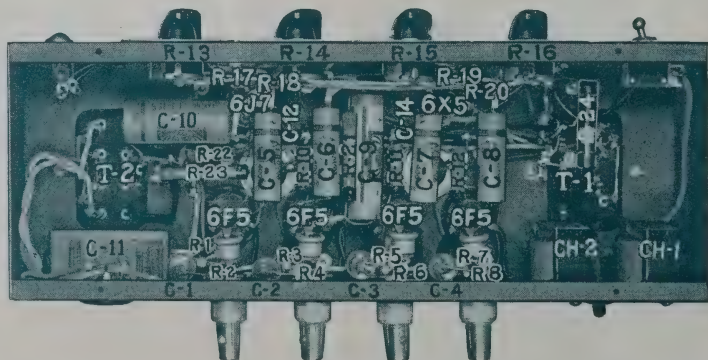
Tubes: 4-6F5, 1-6J7, 1-6X5.

Power Consumption: 25 watts, 115 volts, 50-60 cycles.

Dimensions: 13½" long, 5" deep, 6" high — with cover 8½" high.



FREQUENCY-RESPONSE CURVE



BOTTOM VIEW



THORDARSON

THORDARSON TRANSFORMERS AND CHOKES

No.	
T-1	T-15R04 Power Transformer
T-2	T-15A71 Tube to Line Output Transformer
CH-1	T-13C26 Choke
CH-2	T-13C26 Choke

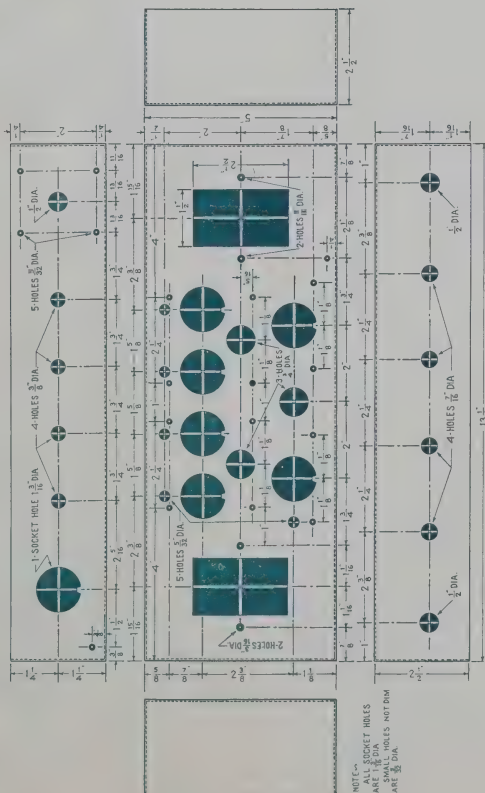
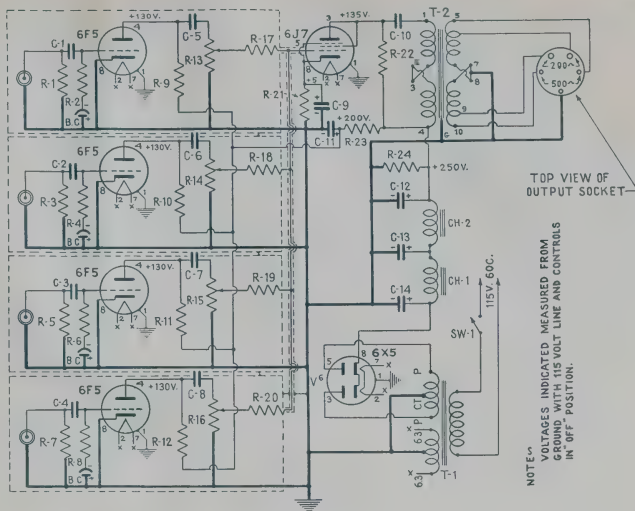
Diagram No.	Ohms	Watts	Type
R-1	5 MEG.	$\frac{1}{4}$	IRC BT-1
R-2	5 MEG.	$\frac{1}{4}$	IRC BT-1
R-3	5 MEG.	$\frac{1}{4}$	IRC BT-1
R-4	5 MEG.	$\frac{1}{4}$	IRC BT-1
R-5	5 MEG.	$\frac{1}{4}$	IRC BT-1
R-6	5 MEG.	$\frac{1}{4}$	IRC BT-1
R-7	5 MEG.	$\frac{1}{4}$	IRC BT-1
R-8	5 MEG.	$\frac{1}{4}$	IRC BT-1
R-9	100,000	1	IRC BT-1
R-10	100,000	1	IRC BT-1
R-11	100,000	1	IRC BT-1
R-12	100,000	1	IRC BT-1
R-13	500,000	Volume Control	Yasley type "N"
R-14	500,000	Volume Control	Yasley type "N"
R-15	500,000	Volume Control	Yasley type "N"
R-16	500,000	Volume Control	Yasley type "N"
R-17	500,000	$\frac{1}{4}$	IRC BT-1
R-18	500,000	$\frac{1}{4}$	IRC BT-1
R-19	500,000	$\frac{1}{4}$	IRC BT-1
R-20	500,000	$\frac{1}{4}$	IRC BT-1
R-21	2,000	1	IRC BT-1
R-22	50,000	1	IRC BT-1
R-23	20,000	1	IRC BT-1
R-24	50,000	10	Ohmite Brown Devil

CONDENSERS			
Diagram No.	Mid.	Voltage	Type
C-1	.1	400 V Paper	Aerovox #484
C-2	.1	400 V Paper	Aerovox #484
C-3	.1	400 V Paper	Aerovox #484
C-4	.1	400 V Paper	Aerovox #484
C-5	.1	400 V Paper	Aerovox #484
C-6	.1	400 V Paper	Aerovox #484
C-7	.1	400 V Paper	Aerovox #484
C-8	.1	400 V Paper	Aerovox #484
C-9	10	25 V Elect.	Cor. Dub. #BR-102
C-10	.5	400 V Paper	Cor. Dub. DT-4P5
C-11	.8	450 V Elect.	Aerovox #P885
C-12	.8	450 V Elect.	Aerovox #GL3450
C-13	.8	450 V Elect.	Aerovox #GL3450
C-14	.8	450 V Elect.	Aerovox #GL3450

4	Type 6F5
1	Type 6J7
1	Type 6X5

1 513132523 Chassis and screen cover - Bud No. 1125
2 51313253 Chassis bottom cover - Bud No. 685
3 Octal sockets - Amphenol SS
4 5-contact socket - Amphenol SS
5 8-prong output plug - Amphenol PM5
6 Mic. connectors - Amphenol PC1M
7 Mic. connectors - Amphenol MC1F
8 Metal tube grid caps
9 Metal grid cap shields
10 AC line cord and plug - Belden No. 1725
11 3F Toggle Switch - Arrow H & H No. 20992
12 Control knobs
13 "Volume" control plates
14 Pilot light bracket and jewel - Yaxley No. 310R
15 Beta cells 1.5 volt - Mallory No. 17
16 Beta cell holders - Mallory No. GB-1A
17 6.3V Pilot light - Mazda No. 40

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



Chassis drawing of Four Channel Pre-Amplifier. Full size template of chassis for drilling, showing all mechanical dimensions available from THORDARSON, 15c net postpaid.



TOP VIEW
DUAL TONE CONTROL

Thordarson's development of this "Dual Tone Control" was prompted by the many requests of sound men for an effective tone compensating system to boost or attenuate the bass or treble frequencies independently of each other. Examination of the schematic diagram will show that the final circuit is simple and not at all complicated to construct. The unit described here is identical in circuit details to the tone compensation employed in the amplifiers shown elsewhere in this "Amplifier Guide." It is constructed on a small chassis, making it adaptable to practically any existing amplifier.

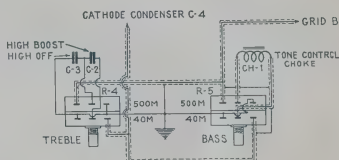
Operation is based on degeneration in the cathode circuit of a 6CS or equivalent tube. If resistance is introduced in the cathode circuit, any signal developed by the tube will also appear across the resistance. This signal voltage is opposite in phase and in series with the voltage impressed on the grid and cathode of the tube. Degeneration takes place and the amplification of the tube is reduced. In this application the plate loading resistor R-6 is made small and the cathode resistor R-3 large so that a greater part of the voltage developed by the tube appears in the cathode circuit.

Since the circuit is resistive there is little or no frequency discrimination at audio frequencies, and all frequencies are degenerated an equal amount. If the cathode resistance is shunted with an inductance (of the proper value) the resistance at low frequencies is practically shorted out due to the low impedance of the choke at low frequencies. Therefore degeneration of the low frequencies is eliminated and the greater part of the signal developed by the tube appears across the load resistor R-6. The result is an increase in the low frequency response of the circuit. Likewise

if a condenser (of the proper value) is shunted across the cathode resistor, the low impedance of the condenser at high frequencies reduces the impedance of the circuit and degeneration of the higher frequencies is reduced. The high frequency response of the circuit is thus increased.

Attenuation of the low frequencies can be accomplished by shunting the grid circuit of the following stage with a choke or inductance. It so happens that the value of the choke (described above) used in the bass boost circuit also has the correct value for an attenuation circuit. The high frequencies can be attenuated by shunting the same grid circuit with a suitable condenser.

The function of control R-5 is to introduce the choke CH-1 into either the cathode circuit for bass boost or the grid circuit for bass decrease. Control R-4 applies condenser C-2 to the cathode circuit for treble increase, or C-3 to the grid circuit for



treble decrease. The controls are coupled to the cathode through condenser C-4 and to the following grid by a shielded lead. The small pictorial drawing illustrates clearly how connections are made to the controls.

To install the tone control unit into an existing amplifier, locate the coupling condenser in a resistance coupled stage (preferably the plate circuit of the second stage of the amplifier). Remove the condenser from the circuit and connect the shielded lead of condenser C-1 and the shielded lead of C-5 in its place. Make sure that the lead from C-1 connects to the plate of the tube preceding the tone control unit. Ground the shields of these leads to the amplifier to complete the ground circuit. Connect the unshielded lead to a well filtered point of the amplifier B supply circuit. A pair of twisted wires not over 3 feet long may be used for the filament supply. No difficulty should be experienced with hum or other disturbance since the unit can be placed several feet from the amplifier. It is also possible to build the tone control into an amplifier if there is adequate room and care is taken not to mount the choke and controls near the power transformer.

PARTS LIST FOR THE DUAL TONE CONTROL

Diagram No.	THORDARSON
CH-1	Tone Control Choke, T-14C70
R-4	Dual Tone Control, Thordarson R-1068
R-5	Dual Tone Control, Thordarson R-1068

RESISTORS

	Ohms	Watts	Type
R-1	250,000	1/2	Centralab #310
R-2	1,000	1	Centralab #314
R-3	20,000	1	Centralab #314
R-6	20,000	1	Centralab #314

CONDENSERS

	Mfd.	Voltage	Type
C-1	.1	400	Cornell-Dubilier #DT-4F1
C-2	.04	400	Cornell-Dubilier #DT-4S4
C-3	.01	400	Cornell-Dubilier #DT-4S1
C-4	10	200	Aerovox #PR-200
C-5	.1	400	Cornell-Dubilier #DT-4F1

TUBE

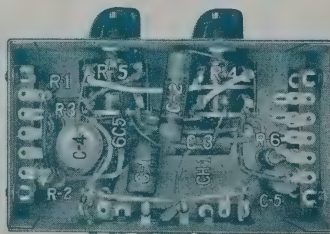
1	Type 6CS
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MISCELLANEOUS PARTS

1	Chassis 6" long, 3 3/4" wide, 3" high
1	Chassis bottom plate
4	5-lug resistor mtg. strips
2	2-lug resistor mtg. strips
1	2-screw terminal board
1	Octal socket Amphenol S8
2	Control knobs
2	"Tone" control plates

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

Curves are shown on opposite page illustrating tone controls in various positions. Full size template of the chassis drawing also shown on opposite page available from THORDARSON, 15c net, postpaid.

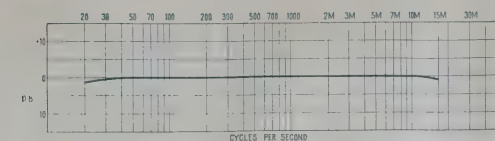


BOTTOM VIEW

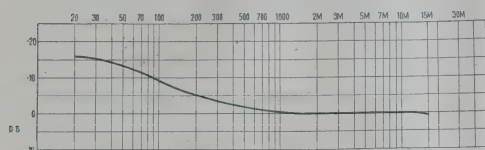


DUAL TONE CONTROL

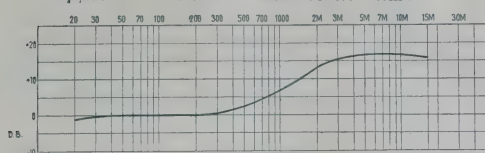
THORDARSON
MADE IN U.S.A.



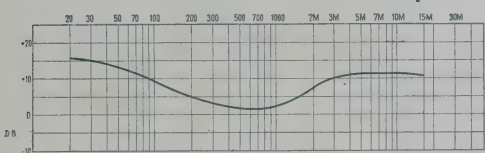
Bass Control normal — Treble Control normal



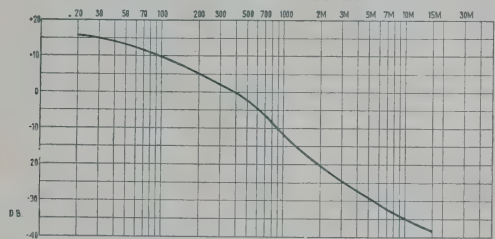
Bass Control increase — Treble Control normal



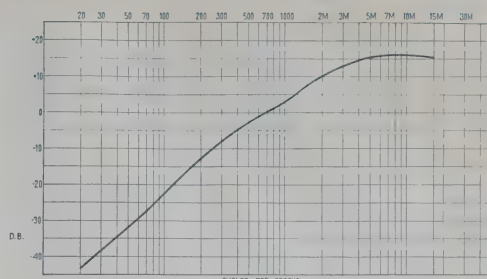
Bass Control normal — Treble Control increase



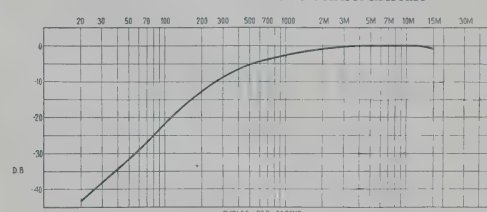
Bass Control increase — Treble Control increase



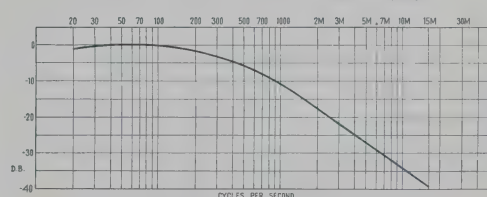
Bass Control increase — Treble Control decrease



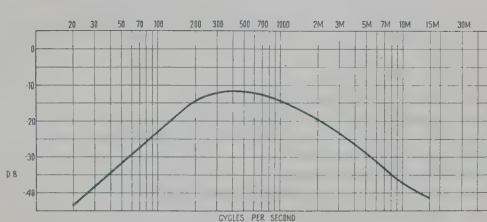
Bass Control decrease — Treble Control increase



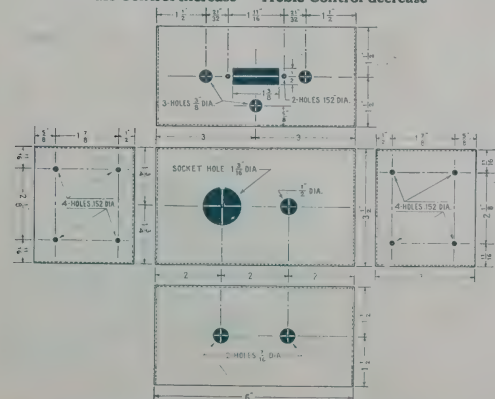
Bass Control decrease — Treble Control normal



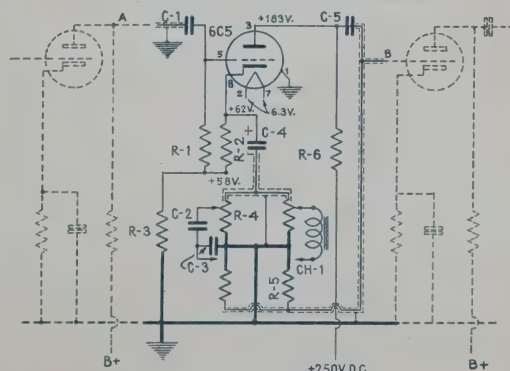
Bass Control normal — Treble Control decrease



Bass Control decrease — Treble Control decrease



Chassis drawing of Dual Tone Control Unit. Full size template available from Thordarson, 15c net, postpaid.



Dual Tone Control. Schematic Diagram.

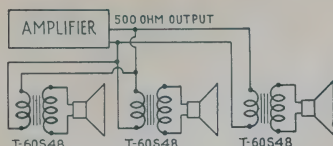


Fig. 1

It is frequently necessary to match a number of speakers to a 500 ohm line in such a way that the speakers take unequal power. It is an easy matter to connect a number of speakers to a 500 ohm line so that each speaker takes the same amount of power and it is also an easy matter to determine the correct impedance ratio of each line to speaker transformer. In Fig. 1, if each of the speakers has a voice coil impedance of 10 ohms, the impedance ratio of the transformers should be 1500:10 so that the three 1500 ohm impedances in parallel will give an impedance of 500 ohms, which is the correct value for the 500 ohm line. In this case, if the total power supplied to the 500 ohm line is 30 watts, each speaker will take one-third of this or ten watts. If this power is to be divided so one speaker receives 15 watts, one 10 watts and one 5 watts, one must make a change in the ratio of the three transformers.

The voltage developed across the 500 ohm line is 122 volts. ($W = \frac{E^2}{R}$; $W = 30$, $R = 500$, $E = \sqrt{15,000}$ or 122 volts). Given the voltage across the 500 ohm line and the voltage required across each voice coil for the desired amount of power, it is an easy matter to determine the turns ratio and the impedance ratio necessary in the various transformers.

For the first speaker, requiring 15 watts of audio, the voltage across the voice coil

is 12.25 volts; ($W = \frac{E^2}{R}$; $W = 15$, $R = 10$,

$E = \sqrt{10 \times 15} = 12.25$ volts). Similarly, the voltage across the speaker requiring 10 watts is 10 volts and the voltage across the speaker requiring 5 watts is 7 volts. The turns ratio of the various transformers is

$\frac{122}{12.25}$ or 10:1. Also $\frac{122}{10}$ or 12.2:1, and also $\frac{122}{7}$ or 17.5:1. The impedance ratio of the

transformer is the turns ratio squared and the actual primary impedance is equal to the turns ratio squared, multiplied by the voice coil impedance of 10 ohms. The reflected primary impedances are all different. However, when the three are paralleled, they result in an impedance of 500 ohms, which is the correct value for the 500 ohm line. In this case, the power delivered to each of the speakers is entirely different from the condition under Fig. 1. It must be remembered when using this method of calculation the total power in the individual voice coils must total the power in the primary from which the value of primary voltage was computed.

Frequently it is not possible to match the impedance of the speaker exactly. Whenever this is not possible and whenever there is a sufficient number of taps

on the output of the amplifier, it should be connected in such a way that a lower plate to plate load than normal is reflected. In other words, if it is necessary to match a 15 ohm speaker to an output transformer which has a 16 ohm tap and a 14 ohm tap, the 15 ohm speaker should be connected to the 16 ohm tap. This will reflect a somewhat lower value of plate to plate load so that it is possible to obtain slightly more power from the amplifier although the distortion will be somewhat greater at the peak output. This is much better than connecting the 15 ohm speaker to the 14 ohm tap, thus reflecting a higher plate to plate load and causing the amplifier to overload at a much lower value of power output. This is especially true of pentode and beam power tubes, where the higher value of plate to plate load will result in a flat top wave and severe distortion will result.

IMPEDANCE RATIO

The transformer is an impedance changer and as such it is not necessarily associated with any one value of impedance. In other words, if a transformer is designed to couple a 500 ohm line to a 10 ohm voice coil, the impedance ratio of the transformer is 50:1, and the same transformer for all practical purposes will just as effectively couple a 1000 ohm line to a 20 ohm coil or a 250 ohm line to a 5 ohm voice coil, provided, of course, that the power handling ability of the transformer is not exceeded. The only serious result of using the primary of a transformer for an impedance other than that for which it was designed is the changing of the frequency response of the transformer and its operating efficiency. In other words, a transformer designed for 500 ohms operation has a certain amount of inductance, which, when used with a 1000 ohm line, will give poorer low frequency response and better high frequency response. On the other hand, a transformer designed for 500 ohm operation when used on a 250 ohm line, will provide better low frequency response but the high frequency response will drop off considerably.

Thoradson line to voice coil transformer, T-60S48, may be used to reflect a primary impedance from 500 to 3000 ohms. It has been designed with high primary inductance and low leakage so that the

frequency response is good over this range. The secondary has a number of taps making it possible to match practically any voice coil impedance or obtain any desired turns ratio. The accompanying table indicates what turns and impedance ratios may be obtained as well as the voice coil impedances when one to six transformers are connected in parallel to a 500 ohm line. The table will aid in connecting voice coils of the same or different impedance where the distribution of power is equal, without the above computation. Only one speaker should be connected to each transformer.

Where there are a number of speakers which already have 500 ohm input transformers to be connected to a 500 ohm line a matching transformer must be used. A number of 500 ohm speakers connected in parallel may be matched to the 500 ohm amplifier output with T-76S74 matching autotransformer. This unit provides five impedances in addition to the original 500 ohms — 250, 166, 125, 100, and 84 ohms. These values are the result of connecting 2, 3, 4, 5, or 6, 500 ohm speakers in parallel.

Two 500 ohm speakers connected in parallel will reflect an impedance of 250 ohms. Connections are made to the common terminal No. 7 and terminal No. 5. If three speakers are used, the reflected impedance will be 166 ohms, in which case the common terminal and terminal No. 4 are used.

THORDARSON transformer T-53S81 will couple a 500 or 250 ohm line to voice coils having 4, 8, or 15 ohms impedance. If desired, two of these transformers may be connected to a 500 ohm line by using a series connection and the 250 ohm tap. It is also possible to connect several speaker voice coils to one of the T-53S81 transformers. If the voice coils have 15 ohms impedance each, two of them could be connected in parallel to the 8 ohm tap. Four 15 ohm voice coils can be wired in series parallel to the 15 ohm tap or in parallel to the 4 ohm tap.

The wires connecting the transformer to the speaker coil should not be any longer than necessary. Long voice coil leads result in loss of power and low frequency. Heavy wire should be used if the transformer is separated from the speaker more than a foot or so.

Table for Connecting Dynamic Speakers of Various Impedances in Same Output System

Secondary Terminals	Turns Ratio	Imped. Ratio	SECONDARY MATCHING IMPEDANCE T-60S48 TRANSFORMER					
			No. of Transformers in Parallel Across 500-ohm Line					
			1	2	3	4	5	6
2 - 4	89:1	7950	.06	.1	.2	.2	.3	.4
5 - 6	65:1	4200	.1	.2	.4	.5	.6	.7
2 - 5	47:1	2200	.2	.4	.7	.9	1.1	1.3
4 - 6	39:1	1500	.3	.6	1.0	1.3	1.6	1.9
3 - 6	32:1	1000	.4	.7	1.1	1.4	1.8	2.1
2 - 6	27:1	730	.6	1.2	2.0	2.7	3.4	4.0
6 - 7	26:1	670	.7	1.4	2.2	2.9	3.6	4.3
1 - 2	19:1	360	1.3	2.7	4.	5.4	6.8	8.1
1 - 3	17:1	290	1.7	3.3	5.	6.7	8.4	10.
1 - 4	16:1	250	2.	4.0	6.	8.	10.	12.
3 - 7	14½:1	210	2.4	4.8	7.2	9.6	12.	14.4
1 - 5	13½:1	190	2.6	5.3	8.	10.6	13.3	16.
2 - 7	13¼:1	175	2.8	5.6	8.4	11.2	14.	16.8
1 - 6	11¼:1	125	4.	8.	12.	16.	20.	24.
1 - 7	7.9:1	62	8.	16.	24.	32.	40.	48.



ADVANTAGES OF INVERSE FEEDBACK (Continued)

CHASSIS DRAWING—6V. D.C. 115V. A.C. AMPLIFIER

THORDARSON

(Continued from page 3)

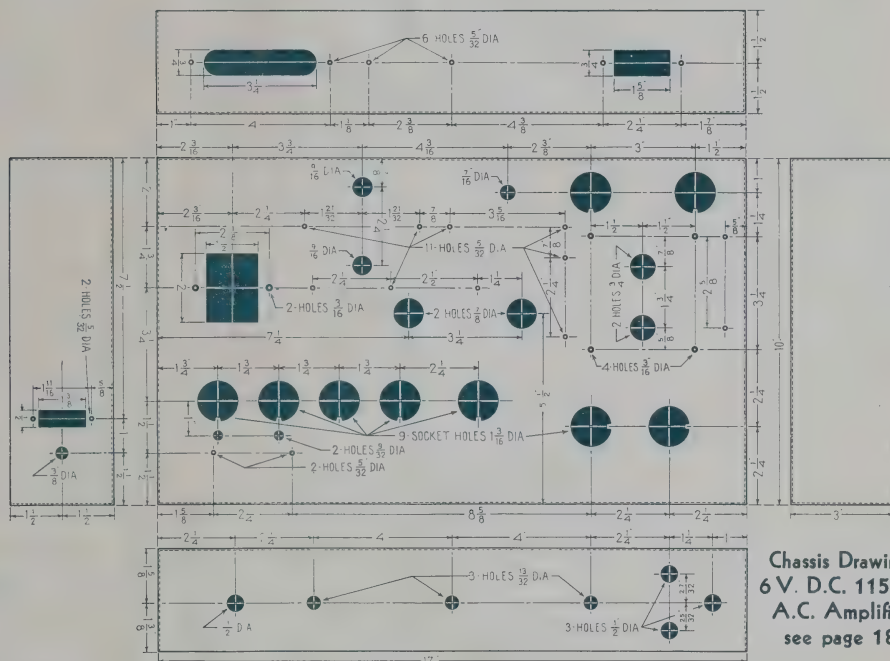
ing effect of the tube is exceedingly small with the result that the damping is negligible. As a result, unnatural "boominess" may result when the speaker is shock excited and the cone vibrates at its own natural period. The natural period depends upon the physical construction of the speaker and is usually in the neighborhood of 50 to 150 cycles.

HUM

Hum in the output stage is cancelled out in much the same way as distortion, since

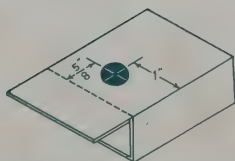
the hum developed in the stage and the voltage fed into the grid circuit are out of phase and tend to cancel. It must be remembered, however, that distortion not appearing in the stage or hum from a previous stage will not be cancelled by inverse feedback in the output stage. Great reductions in plate circuit distortion and plate resistance may be obtained by the use of large amounts of inverse feedback. However, the limiting factor in inverse feedback is the amount of desired gain from the stage in question. In actual design the amount of inverse feedback is a

compromise between the gain and the desired reduction in distortion. If there is enough gain in the previous stages and if the driver tube can supply the necessary peak voltage, it will be advisable to increase the amount of inverse feedback in order to reduce the plate resistance and the plate circuit distortion. However, if the plate resistance is fairly low and if the plate circuit distortion is a reasonable value, there is not much advantage gained in further reducing the gain by the addition of more inverse feedback.

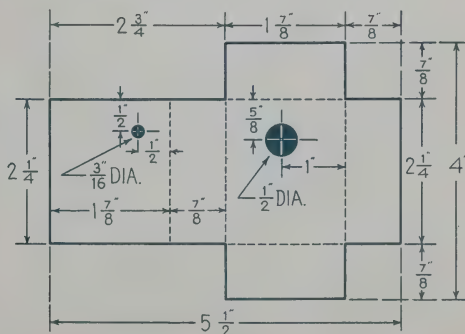


Chassis Drawing
6V. D.C. 115V.
A.C. Amplifier
see page 18

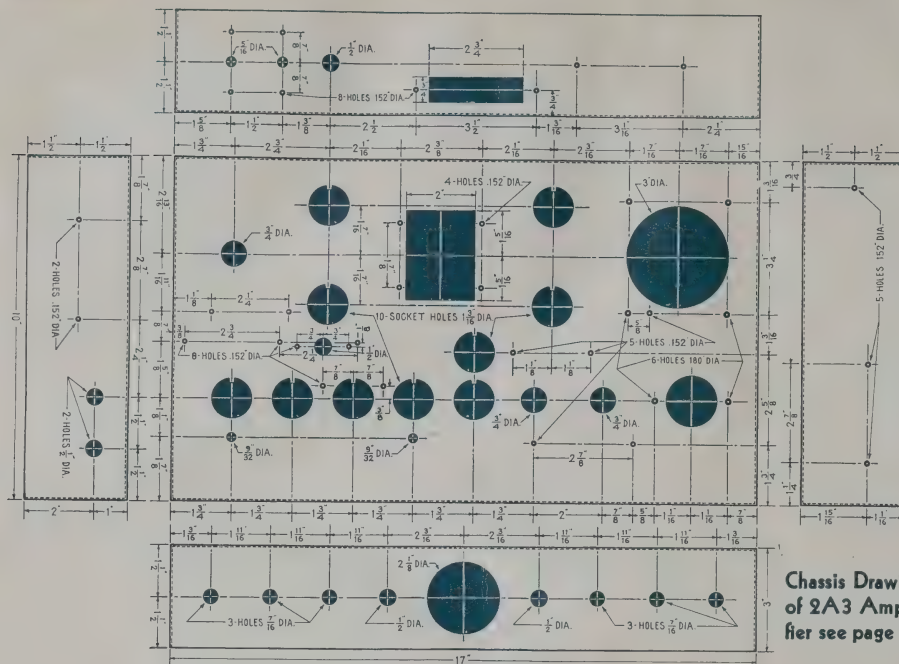
Input Circuit Shield Can



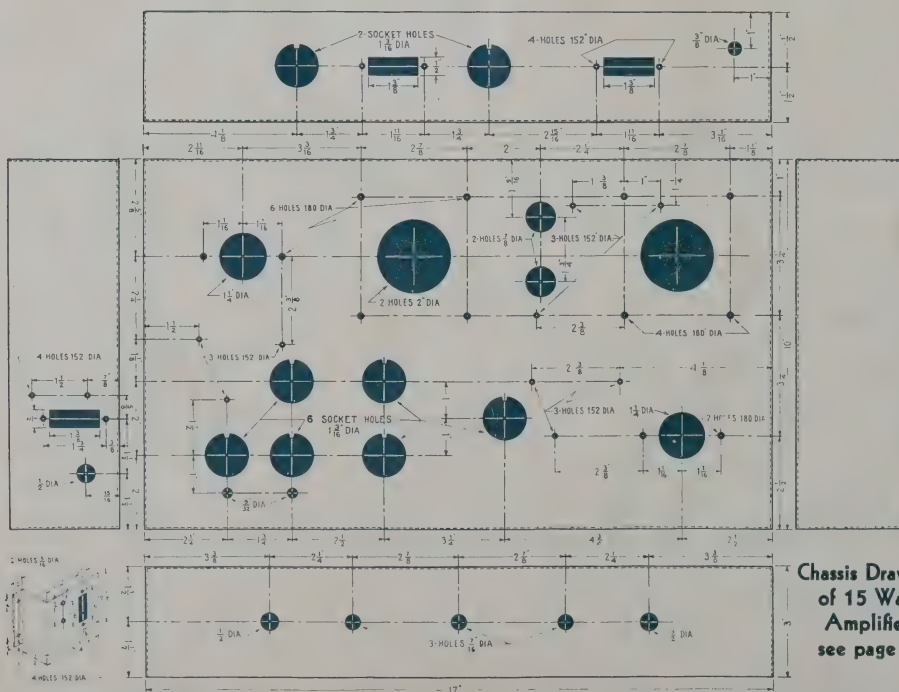
Cut shield from metal and bend to form a can as above, solder together leaving one side open until mounted, and small parts are installed and wired.



Full size template of Chassis available from Thordarson, 15c net, postpaid



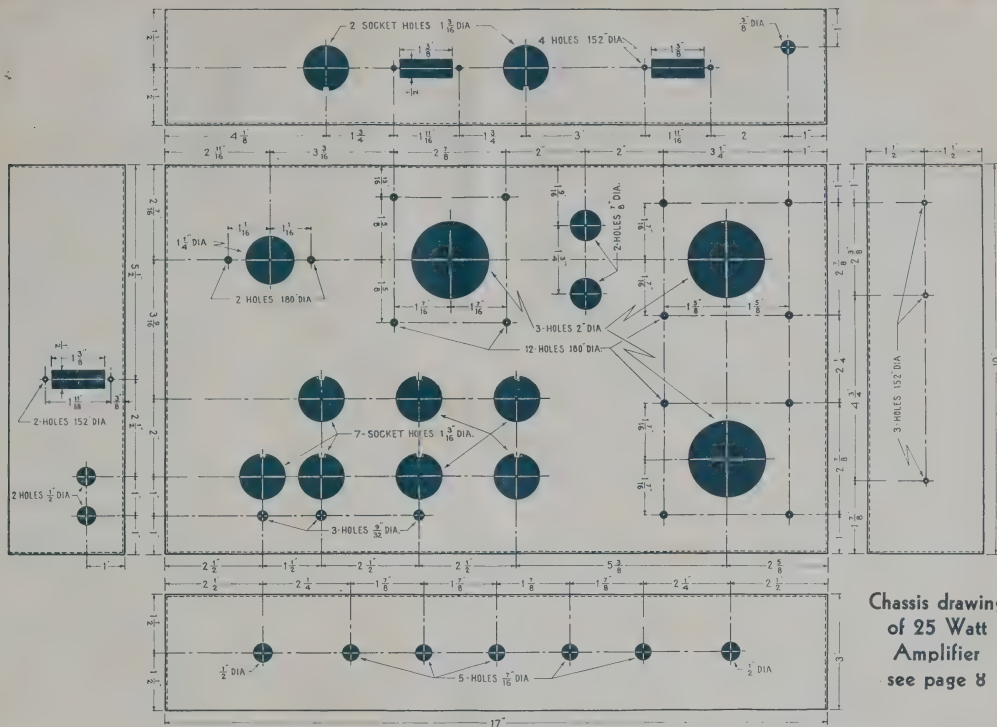
**Chassis Drawing
of 2A3 Ampli-
fier see page 16**



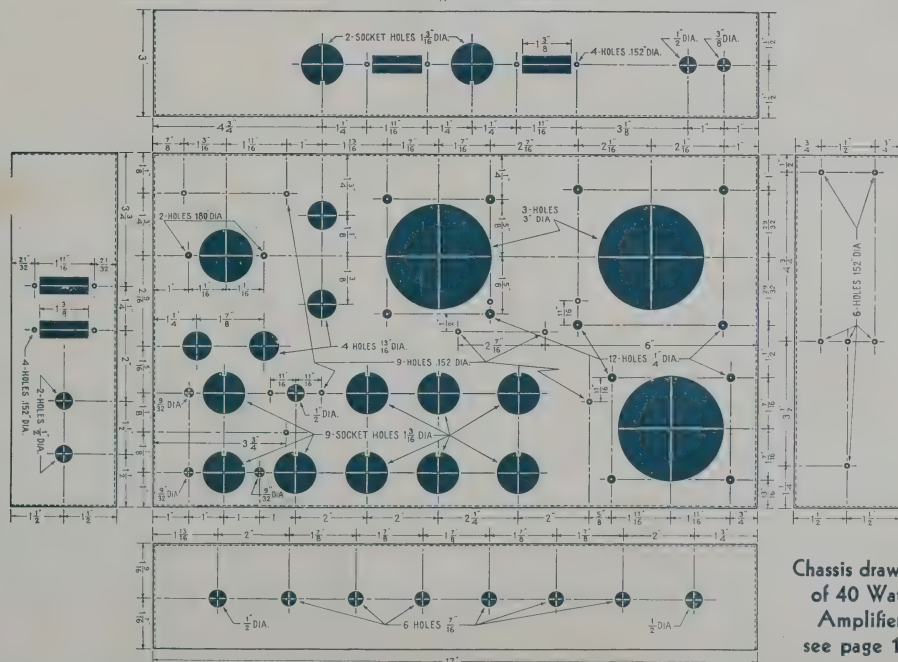
**Chassis Drawing
of 15 Watt
Amplifier
see page 6**



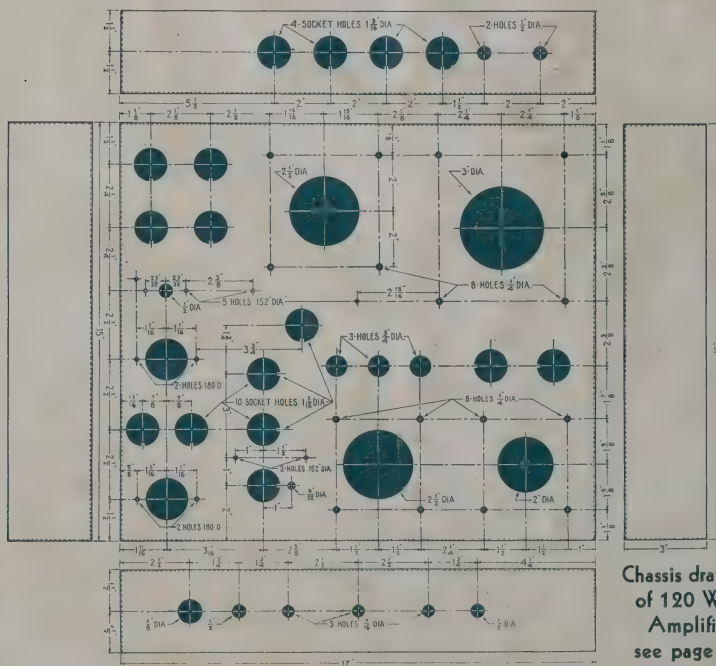
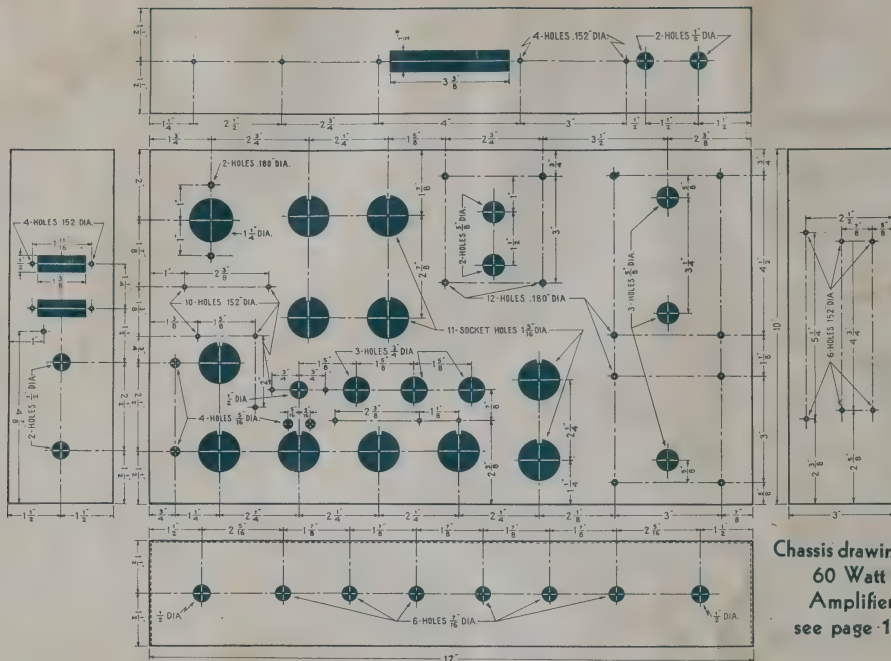
THORDARSON



Chassis drawing
of 25 Watt
Amplifier
see page 8



Chassis drawing
of 40 Watt
Amplifier
see page 10





15¢

THORDARSON

Transmitter Guide

No. 344-E

Since 1895—

Since 1895 the Thordarson organization has pioneered in the development and manufacture of quality transformers in the progressive electrical world. The policy of the company—to engineer the best product for the application—is consistently maintained. Small wonder that Thordarson is the recipient of both national and international awards for outstanding contributions to better engineering.

From the earliest spark coil days Thordarson has devoted the major part of its engineering and laboratory resources to the development of Amateur Radio. Today, the Amateur Radio fraternity is the training ground for broadcast, communications and government engineers.

To further promote the interest and pleasure of this worthy hobby, Thordarson presents this latest Transmitter Guide. This guide offers you a wide choice of units from the smallest transmitter for the beginner to the larger and more elaborate rigs for the advanced amateur. These transmitters are conservatively rated and employ the latest technical developments for efficient and economical operation. The cabinets and panels are beautifully designed and the circuits are adaptable to a multitude of amateur applications. Simplified construction methods are employed throughout the guide and the use of Thordarson transformers and chokes will insure perfect performance for many years.

Our sincere wish is that this guide will enable you to find many hours of enjoyment in contacting old friends and making new ones on the amateur bands.



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20 Watt CW Transmitter

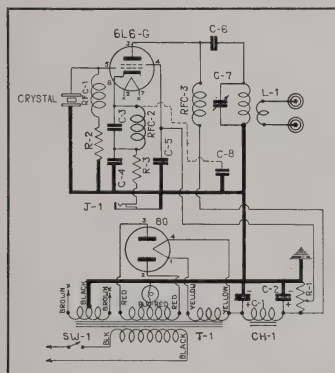
FOR the newcomer in amateur radio desiring a simple yet reliable transmitter, this transmitter with metal chassis has been designed. Its crystal controlled circuit is of such a type that operation is possible on five amateur bands. If higher power is desired at some later date this transmitter may also be used as the crystal oscillator stage of a larger multi-stage transmitter.

Circuit Operation

Operation on the five amateur bands from 160 to 10 meters is possible. On all of these five bands the oscillator will work "straight through"; that is, the crystal frequency and the output frequency are the same. In addition, the oscillator will give good outputs when doubling, using 160, 80 and 40 meter crystals.

The plug-in coils on this transmitter are of a type having a built-in link on the "cold" end of the coil. If used as the exciter for a larger transmitter this unit may be link-coupled or capacity-coupled to the succeeding stage.

Successful operation of this type



35 Watt Phone-CW Transmitter



Cabinet View



Chassis View

THIS compact transmitter is capable of 35 watts input on CW and phone. Its power supply and its Class B audio amplifier are included on the same chassis as the RF section, and its flexibility makes it a desirable transmitter for those wishing low power on the five amateur bands from 160 to 10 meters. The complete transmitter is built upon a rectangular chassis and is housed in an attractive cabinet with a curved panel of modern design. The cabinet, panel and chassis are finished in gray flat enamel. All controls are mounted on the front panel.

The 6V6-G crystal oscillator circuit easily provides enough driving power for the 6L6-G final amplifier. The oscillator and amplifier plate voltage is 315 V, and the oscillator screen voltage is 210V. Harmonic operation of the crystal oscillator may be obtained when using 160, 80 and 40 meter crystals.

There is a condition of optimum excitation for the beam power final amplifier. In some cases it may be desirable to reduce the output of the oscillator stage so that the final stage will not be overdriven. To do this the oscillator tank is detuned by turning the tank condenser toward its minimum capacity setting.

The final amplifier may be worked "straight through," or it may be used for doubling. It delivers good power outputs when doubling to 80, 40, 20 and 10 meters. The final amplifier stage uses plate neutralization so that even on the highest frequencies no difficulty is experienced with self-oscillation. Cathode bias is used on the

final amplifier; this aids in limiting the plate current when the final tank is not tuned to resonance or when there is no excitation on the final grid.

The plate tank coils for both stages are of the plug-in type. Although the crystal oscillator stage is capacity coupled to the final amplifier stage, the plug-in coil used is a Bud type OEL having a link on one end so that the coil may be used in other applications. The final tank coil is of the center-taped, center-linked type with a semi-fixed link. For the amateur who changes bands often, this provides the advantage of being able to change coils without changing the loading adjustment for each band.

Both the oscillator and final stage are keyed. The keying jack is of the closed circuit type so that no change in connections is necessary for changing quickly from CW to phone operation.

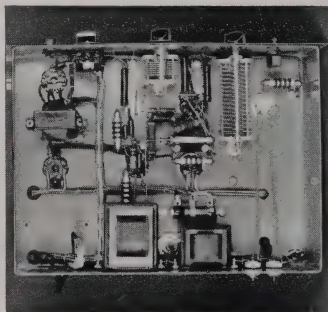
When properly loaded, the plate current in the final amplifier stage is

110 MA; and the current in the crystal oscillator plate is 25 to 30 MA. The modulator is a Class B 6A6 operating with 255 volts on the plate. Despite the high plate voltage, operation is very satisfactory in intermittent service.

The 6A6 operates at zero bias, and it is driven by another 6A6 triode with its two sections in parallel. The plates of the driver are also operated at 325 volts. The cathode bias on the driver is of the order of 5 to 6 volts. High gain is realized in this stage so that no additional amplification is needed to obtain 100% modulation when using a carbon microphone.

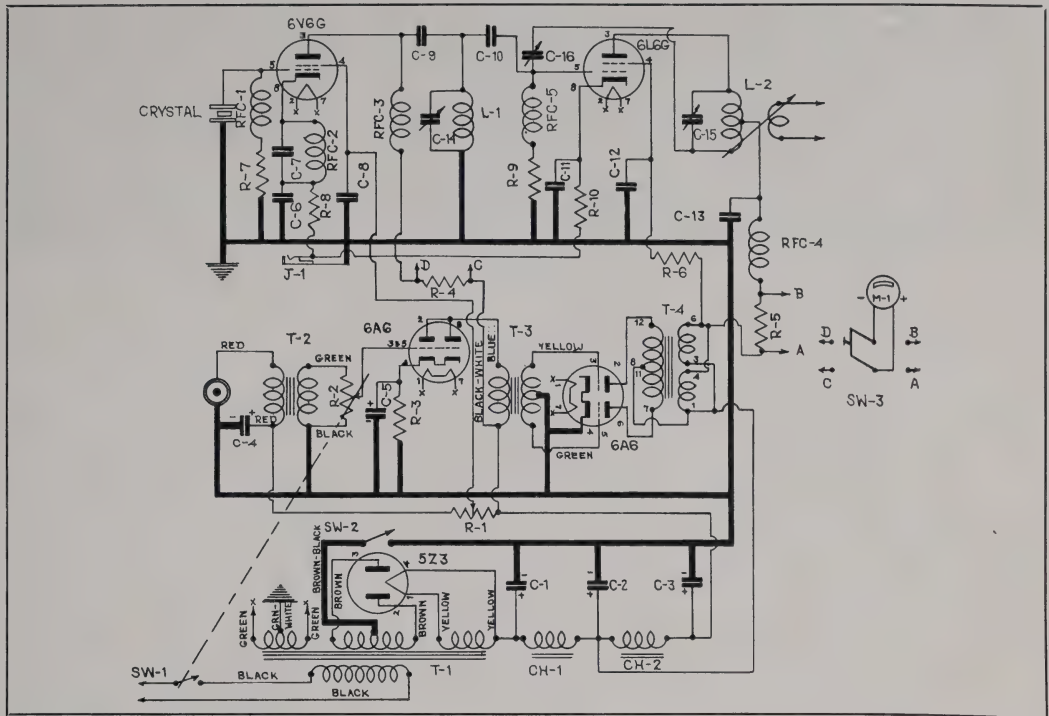
The current for the carbon microphone is obtained by passing the bleeder current through the microphone circuit. Adequate filtering is provided so that no hum enters the audio circuit at this point. In order that the removal of the microphone plug from the chassis will not place a high voltage across C-4, the microphone connector is of the shorting type which closes the microphone circuit even when the microphone has been removed. With such a feature the operator can never inadvertently place high voltage on the condenser, C-4.

The power supply uses a 5Z3 rectifier tube. Separate switches are provided for the plate and filament supplies. A filament switch is mounted on the volume control. A handy toggle-switch on the panel controls the plate supply. A single meter is provided with switching which permits the reading of either the final plate or the oscillator plate current.



Bottom View

35 Watt Phone-CW Transmitter



Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-1	T-92R21	Power Transformer
T-2	T-86A02	Microphone Transformer
T-3	T-19D06	Driver Transformer
T-4	T-19M13	Modulation Transformer
CH-1	T-13C30	Filter Choke
CH-2	T-74C30	Filter Choke

Resistors:

R-1	20,000 Ohm 25 Watt Semi-Variable Resistor
R-2	500,000 Ohm Volume Control with Switch
R-3	1,000 Ohm 1 Watt Resistor
R-4	50 Ohm 10 Watt Resistor
R-5	50 Ohm 10 Watt Resistor
R-6	3,500 Ohm 10 Watt Resistor
R-7	50,000 Ohm 1 Watt Resistor
R-8	200 Ohm 10 Watt Resistor
R-9	20,000 Ohm 1 Watt Resistor
R-10	200 Ohm 10 Watt Resistor

Condensers:

C-1	8 Mfd. 600 Volt Condenser
C-2	Double 8 Mfd. 450 Volt Condenser
C-3	10 Mfd. 25 Volt Electrolytic Condenser
C-4	10 Mfd. 25 Volt Electrolytic Condenser
C-5	10 Mfd. 25 Volt Electrolytic Condenser
C-6	.002 Mfd. 500 Volt Mica Condenser
C-7	.0001 Mfd. 500 Volt Mica Condenser
C-8	.002 Mfd. 500 Volt Mica Condenser
C-9	.002 Mfd. 1,000 Volt Mica Condenser
C-10	.0001 Mfd. 1,000 Volt Mica Condenser
C-11	.002 Mfd. 1,000 Volt Mica Condenser
C-12	.002 Mfd. 1,000 Volt Mica Condenser
C-13	.002 Mfd. 1,000 Volt Mica Condenser
C-14	100 Mmfd. Variable Condenser

Condensers: (Cont.)

C-15	100 Mmfd. Variable Condenser
C-16	Neutralizing Condenser

RF Chokes:

RFC-1	RF Choke
RFC-2	RF Choke
RFC-3	RF Choke
RFC-4	RF Choke
RFC-5	RF Choke

Miscellaneous Parts:

1	Chassis 14" x 10" x 3" (Punched and Drilled)
1	Panel (Punched and Drilled)
1	Cabinet
4	Feed-thru Insulators
2	5-Contact Sockets, Steatite
2	7-Contact Sockets, Large
2	Octal Sockets
1	4-Contact Socket
1	5-Contact Socket
1	Switch Plate
1	SPST Switch
1	DPDT Toggle Switch
1	Mic. Input Plug
1	Input Plug Shield
3	Knobs
2	Name Plates Marked "CRYSTAL OSC. PLATE"
2	Name Plates Marked "POWER AMP. PLATE"
1	Name Plate Marked "A.F. GAIN"
1	Name Plate Marked "PLATE VOLTAGE"
1	Name Plate Marked "MICROPHONE"

Miscellaneous Parts: (Cont.)

1	Circuit Closing Jack
1	Line Cord and Plug
Miscellaneous nuts, bolts, soldering and mounting lugs, lock-washers and other hardware.	

Accessories:

1	L-1 160 Meter RF Coil, End Linked, Bud Type OEL-160 or Equivalent
1	L-1 80 Meter RF Coil, End Linked, Bud Type OEL-80 or Equivalent
1	L-1 40 Meter RF Coil, End Linked, Bud Type OEL-40 or Equivalent
1	L-1 20 Meter RF Coil, End Linked, Bud Type OEL-20 or Equivalent
1	L-1 10 Meter RF Coil, End Linked, No Tap Bud Type OEL-10 or Equivalent
1	L-2 160 Meter RF Coil, Center Linked, Center Tapped, Bud Type OLS-160 or Equivalent
1	L-2 80 Meter RF Coil, Center Linked, Center Tapped, Bud Type OLS-80 or Equivalent
1	L-2 40 Meter RF Coil, Center Linked, Center Tapped, Bud Type OLS-40 or Equivalent
1	L-2 20 Meter RF Coil, Center Linked, Center Tapped, Bud Type OLS-20 or Equivalent
1	L-2 10 Meter RF Coil, Center Linked, Center Tapped, Bud Type OLS-10 or Equivalent
1	0-150 MA DC Meter, 2" Square Case, No Illumination Triplet 227-A or Equivalent
1	Crystal
1	6V6G Tube
1	6L6-G or 6L6GX Tube
1	5Z3 Tube
2	6A6 Tubes

Complete kit of the above parts with large size circuit diagram available from your local Thordarson distributor. (Accessories not included in kit).



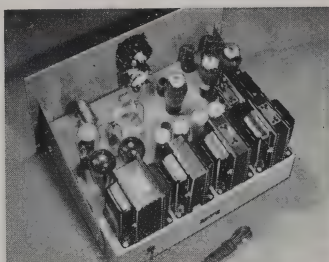
TRANSFORMER SPECIALISTS SINCE 1895



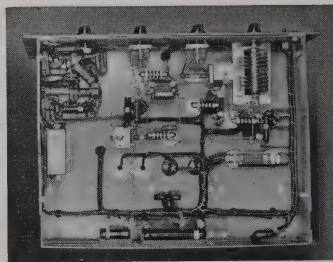
50 Watt 5 and 10 Meter Phone Transmitter



Cabinet View



Chassis View



Bottom View

THIS transmitter, designed especially for operation on the 5 and 10 meter bands, includes on one chassis a 50 watt RF section, a 25 watt modulator and the power supplies for both the RF section and modulator.

The tube line-up for the RF section is a 6L6-G tri-tet oscillator, an HK-24 doubler and an HK-24 final amplifier.

The 6L6-G oscillator uses 40 and 20 meter crystals for transmitter outputs on 10 and 5 meters respectively. The plate tank of the tri-tet is always to be tuned to a frequency double that of the crystal, and in this condition good outputs are obtained. Attempts to operate the oscillator plate tank at the crystal frequency when using a 6L6-G are likely to damage the crystal. The coil and condenser combination, L-1 and C-1, has been chosen to give a good oscillator output with reasonably low crystal current.

The HK-24 driven by the oscillator is not neutralized and is always used as a doubler stage delivering power on 10 and 5 meters. The crystal oscillator and doubler stages operate at a plate voltage of 400 volts, and the voltage on the screen-grid of the oscillator is 250.

The HK-24 final amplifier is a conventional Class C stage using a split-stator tank condenser with plate neutralization. Neutralization is accomplished as easily as in transmitters operated at lower frequencies. The neutralizing condenser, C-15, is located on the under side of the chassis and is supported by the large wire connected to its terminals. It should always be adjusted with a non-metallic screw driver.

The oscillator cathode and plate tank coils are wound on 1" forms, and

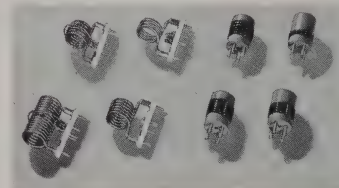
the doubler and final amplifier coils are self-supporting coils wound with large copper wire and mounted on National type PB-16 plugs. The doubler plate tank is capacity coupled to the final amplifier grid, and power is taken from the final amplifier plate coil by means of a link which is supported on the coil base terminals. When properly loaded, the final amplifier plate current is 60 MA at 800 volts. The plate transformer has a nominal rating of 750 volts DC, but because of the light loading the higher plate voltage is obtained. The excitation of the final amplifier tube is such that 25 to 30 MA grid current is obtained. The cathode tank of the tri-tet oscillator should be adjusted for the maximum output consistent with good oscillator stability. It will be found that this occurs with the 100 mmfd. cathode condenser, C-1, at about one-half of its maximum capacity.

A meter, M-1, and meter switch, SW-3, are provided for metering the current to the oscillator plate, the

doubler plate, the final amplifier grid and the final amplifier plate.

The modulator uses two 6L6-G tubes in push-pull and operates at a plate voltage of 400 and a screen-grid voltage of 260, operating in Class AB₁. The audio amplifier tube line-up is one 6J7 pentode, one 6J7 triode and one 6N7 phase inverter. This arrangement provides high gain for use with crystal microphones.

The power supply uses a single transformer to supply all filaments and a dual plate transformer to supply two separate rectifiers. These transformers are controlled by separate



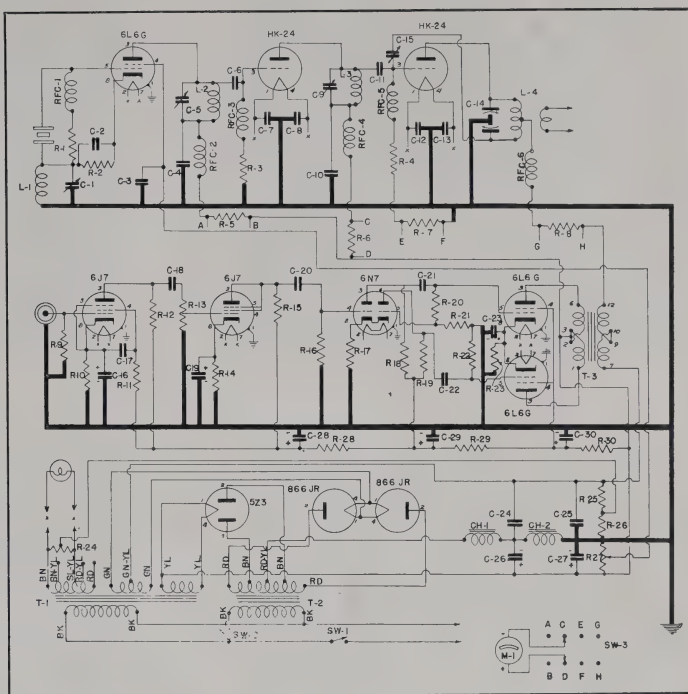
Coil	10 METER OPERATION				5 METER OPERATION			
	Turns	Wire Size	Diam. of Winding	Winding Length	Turns	Wire Size	Diam. of Winding	Winding Length
L-1	10	No. 16 Enam.	1"	Close Wound	4	No. 16 Enam.	1"	Close Wound
L-2	11	No. 16 Enam.	1"	7/8"	6	No. 16 Enam.	1"	3/4"
L-3	7	No. 10 Bare	1"	1"	3	No. 8 Bare	1"	3/4"
L-4	16 Center-Tapped	No. 10 Bare	1"	2"	6 Center-Tapped	No. 8 Bare	1"	1"

Link coupled to L-4 is of No. 14 bare copper wire 1 1/2" in diam. wound over the center of the plate tank coil and supported by the lugs attached to the pins on the PB-16 base. For 10 meters a 2 turn link is used; for 5 meters, a 1 turn link. Coils L-1 and L-2 are wound on 1" forms, Millen No. 45004. Coils L-3 and L-4 are self-supporting on National PB-16 plugs.

50 Watt 5 and 10 Meter Phone Transmitter

switches on the panel. The filament switch, SW-1, is associated with the audio amplifier gain control, and the plate switch, SW-2, is of the toggle type placed in a position for convenient operation. The 400 volt supply delivers the current required by the oscillator, doubler, modulator and audio stages. It uses a type 5Z3 rectifier tube. The 800 volt supply handles the final plate power only. Although this transformer is rated at 400 and 750 volts, it is being operated at less than full load so that advantage may be taken of the higher-than-normal voltage available. Economy in the filtering of the two high voltage power supplies is obtained by using the same chokes for filtering the output of both rectifier systems. These chokes are in series with the center tap of the dual plate transformer.

The complete unit is contained on a chassis 17" x 13" x 3" and is attached to a panel 19" x 10 1/2" with the conventional type of chassis mounting brackets. The chassis, panel and chassis mounting brackets are finished in gray flat enamel, giving an unusually attractive appearance with the chromium dial plates. The transmitter may be enclosed in a cabinet or mounted in a rack with other equipment.



Parts Required

THORDARSON TRANSFORMERS and CHOKES:

T-1	T-19F77	Filament Transformer
T-2	T-19P70	Plate Transformer
T-3	T-19M14	Modulation Transformer
CH-1	T-75C51	Choke
CH-2	T-75C51	Choke

Resistors:

R-1	50,000 Ohm 1 Watt Resistor
R-2	350 Ohm 10 Watt Resistor
R-3	10,000 Ohm 10 Watt Resistor
R-4	2,500 Ohm 10 Watt Resistor
R-5	50 Ohm 10 Watt Resistor
R-6	50 Ohm 10 Watt Resistor
R-7	50 Ohm 10 Watt Resistor
R-8	50 Ohm 10 Watt Resistor
R-9	5 Megohm 1/2 Watt Resistor
R-10	5,000 Ohm 1 Watt Resistor
R-11	3 Megohm 1/2 Watt Resistor
R-12	500,000 Ohm 1/2 Watt Resistor
R-13	1 Megohm Volume Control with Switch
R-14	5,000 Ohm 1 Watt Resistor
R-15	100,000 Ohm 1 Watt Resistor
R-16	250,000 Ohm 1/2 Watt Resistor
R-17	2,000 Ohm 1/2 Watt Resistor
R-18	100,000 Ohm 1 Watt Resistor
R-19	100,000 Ohm 1 Watt Resistor
R-20	250,000 Ohm 1/2 Watt Resistor
R-21	12,000 Ohm 1/2 Watt Resistor
R-22	250,000 Ohm 1/2 Watt Resistor
R-23	250 Ohm 10 Watt Resistor
R-24	20 Ohm 10 Watt Center Tapped Resistor
R-25	40,000 Ohm 50 Watt Resistor
R-26	300 Ohm 10 Watt Resistor
R-27	20,000 Ohm 50 Watt Semi-Variable Resistor
R-28	20,000 Ohm 1 Watt Resistor
R-29	20,000 Ohm 1 Watt Resistor
R-30	7,500 Ohm 25 Watt Semi-Variable Resistor

Condensers:

C-1	100 Mmfd. Variable Condenser
C-2	.01 Mfd. 400 Volt Condenser
C-3	.002 Mfd. 1,000 Volt Mica Condenser
C-4	.002 Mfd. 1,000 Volt Mica Condenser
C-5	35 Mmfd. Variable Condenser
C-6	.0001 Mfd. 1,000 Volt Mica Condenser
C-7	.002 Mfd. 1,000 Volt Mica Condenser
C-8	.002 Mfd. 1,000 Volt Mica Condenser
C-9	35 Mmfd. Variable Condenser
C-10	.002 Mfd. 1,000 Volt Mica Condenser
C-11	.0001 Mfd. 1,000 Volt Mica Condenser
C-12	.002 Mfd. 1,000 Volt Mica Condenser
C-13	.002 Mfd. 1,000 Volt Mica Condenser
C-14	35-35 Mmfd. Variable Condenser
C-15	Neutralizing Condenser
C-16	10 Mfd. 25 Volt Electrolytic Condenser
C-17	.04 Mfd. 400 Volt Condenser
C-18	.04 Mfd. 400 Volt Condenser
C-19	10 Mfd. 25 Volt Electrolytic Condenser
C-20	.1 Mfd. 400 Volt Condenser
C-21	.1 Mfd. 400 Volt Condenser
C-22	.1 Mfd. 400 Volt Condenser
C-23	10 Mfd. 25 Volt Electrolytic Condenser
C-24	2 Mfd. 1,000 Volt Condenser
C-25	2 Mfd. 1,000 Volt Condenser
C-26	8 Mfd. 600 Volt Electrolytic Condenser
C-27	8 Mfd. 600 Volt Electrolytic Condenser
C-28	
C-29	
C-30	Triple 8 Mfd. 450 V Electrolytic Condenser

RF Chokes:

RFC-1	RF Choke
RFC-2	RF Choke
RFC-3	RF Choke
RFC-4	RF Choke
RFC-5	RF Choke
RFC-6	RF Choke

Miscellaneous Parts:

1	Chassis 17" x 13" x 3" (Punched and Drilled)
1	Panel 19" x 12 1/2" (Punched and Drilled)
1	Pr. Chassis Mounting Brackets
6	Octal Sockets
1	4-Contact Socket
6	4-Contact Sockets, Isolantite
2	Plug-in Sockets
4	Plug-in Bases
4	Coil Forms
1	Crystal Socket
4	Knobs
1	Pointer Knob
1	SPST Switch, N. P.
1	Double-Pole, 4-Throw Switch, Isolantite
1	Input Plug
1	Input Shield
2	Metal Tube Grid Caps
2	Metal Tube Grid Cap Shields
2	Name Plates Marked "POWER AMP. PLATE"
1	Name Plate Marked "POWER AMP. GRID"
2	Name Plates Marked "BUFFER PLATE GRID"
2	Name Plates Marked "CRYSTAL OSC. PLATE"
1	Name Plate Marked "AF GAIN"
1	Line Cord and Plug

Miscellaneous nuts, bolts, soldering and mounting lugs, lock-washers and other hardware.

Accessories:

1	0-150 MA DC Meter 3" Square Case, Rear Illumination, Triplett 327A or Equivalent
1	Cabinet
1	Crystal
2	6J7 Tubes
1	6N7 Tube
2	6L6-G or 6L6GX Tubes
1	5Z3 Tube
2	866-JR Tubes
2	HK-24 Tubes

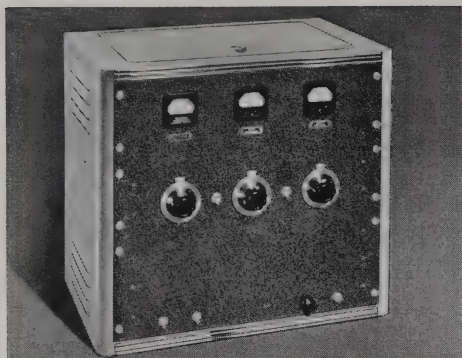
Complete kit of the above parts with large size circuit diagram available from your local Thordarson distributor. (Accessories not included in kit).



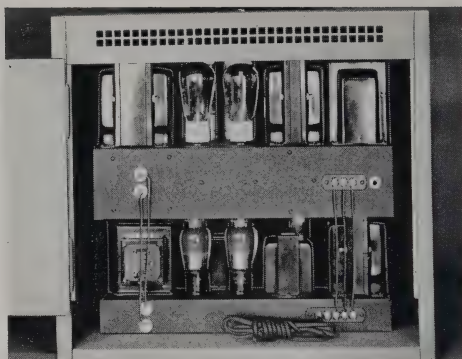
TRANSFORMER SPECIALISTS SINCE 1895

THORDARSON

55 Watt Phone, 80 Watt CW Transmitter



Cabinet View



Rear View

COMPACTNESS, reliability, ease of operation and neatness of appearance are salient features of this 55 watt phone and 80 watt CW transmitter. Designed with entirely separate audio and RF sections and each having its own power supply, either of these two matched units may be used separately. For the CW operator the compact and neat appearing RF section is a pleasure to have on the operating table or in the rack. Operating with 80 watts input, the high plate efficiency of the final stage not only makes it an outstanding transmitter but also a highly desirable exciter unit for transmitters having inputs as high as 500 watts. Circuits are strictly conventional, and components are conservatively chosen.

The modulator, with an output of 30 watts, easily modulates the 55 watt Class C input of the RF amplifier. The high gain (122 db) enables it to modulate the transmitter 100% with very weak audio signals. With the Multi-Match modulation transformer the amateur may use it to modulate any transmitter requiring 30 watts of audio power.

The RF line-up is as follows: a 6F6-G crystal oscillator stage, a 6L6-G buffer-doubler stage, and an 809 final amplifier stage. The 6F6-G operates with 320 volts on the plate and 270 volts on the screen-grid. The 6L6-G operates with a plate voltage of 340 volts and a screen-grid voltage of 250. For phone operation the voltage on the 809 plate is 625 volts, and for CW operation this voltage is raised to 785.

The oscillator stage operates with all crystals from 160 to 10 meters, but

for best stability and freedom from "chirps" it is recommended that for 10 meter operation a 20 meter crystal be used and doubling be carried on in the buffer-doubler stage. When the crystal stage is in an oscillating condition and is loaded by the grid of the next stage, the oscillator plate current is approximately 30 to 40 MA. The buffer-doubler stage is neutralized and may be used with excellent results either for frequency multiplying or as a regular buffer. When using 160 and 80 meter crystals, not only is doubling easily accomplished in the second stage but enough output can be obtained by quadrupling to give good excitation to the 809 grid on 40 and 20 meters. When the 6L6-G is driving the 809 grid to 30 MA of grid current, the plate current of the 6L6-G is on the order of 70 MA. The antenna loading should be adjusted so that the final amplifier plate current is 88 MA for a 55 watt phone input. For an 80 watt CW input the loading is adjusted so that the final amplifier plate current is 102 MA. The secondary of the plate transformer supplying energy to the final amplifier is equipped with taps so that by merely changing these taps the change from 625 volts for phone operation to 785 volts for CW operation may be made. Correct tuning of the buffer-doubler plate circuit is accomplished by noting the grid current reading of the final amplifier stage. Care should be taken that the 6L6-G plate circuit is not tuned to some undesired harmonic of the crystal frequency.

The same final tank coil is used for operation on 80 and 160 meters. For

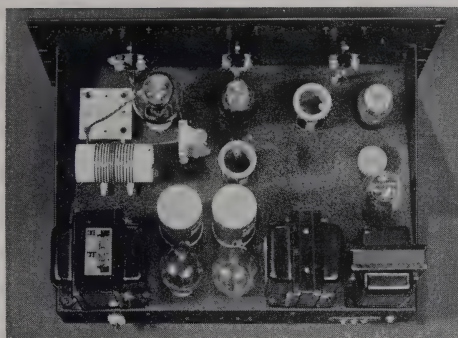
160 meter operation a fixed air condenser is plugged into the jack-base which is shown in the top view of the RF section on page 9. If the amateur does not desire operation on 160 meters, it is unnecessary to have the Cardwell JB base or the Cardwell JD-80-OS condenser. The spacing of the final tank condenser is 0.070", which is greater than is usually found for use with the voltages encountered in this circuit. However, such spacing permits grounding of the rotor. Should the amateur wish to build for CW operation only, a spacing of 0.050" is satisfactory.

The modulator has for its output stage two 6L6-G's operating in Class AB₁. At no-signal the plate-to-ground (-B) voltage is 390 volts. The screen-grid voltage to ground should be adjusted by means of R-14 to a value of 310 volts. In this condition the voltage measured from cathode to ground across R-13 is 20 volts.

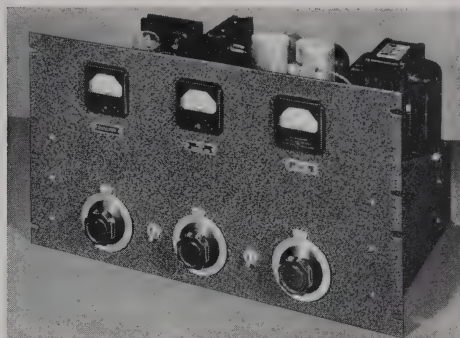
The three stages before the output stage provide adequate gain for the use of this modulator with all types of microphones. The input to the first stage, a pentode-connected 6J7, is shielded to avoid hum pick-up and to prevent pick-up of RF energy. As a further precaution against the entrance of RF energy to the grid of this stage, a filter consisting of C-1, RFC-1 and C-2 is installed in the input circuit. These elements, in addition to the grid lead and R-1, are carefully shielded with pieces of tinned copper. The result is that with the volume control wide open, the amplifier operates perfectly; and the residual hum is 45 to 50 db below the full output power.

(Continued on Page 10)

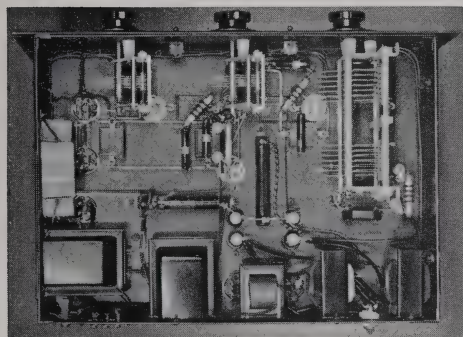
55 Watt Phone, 80 Watt CW Transmitter



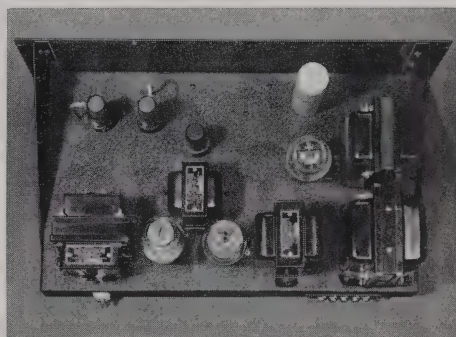
Top View of RF Section



Front View of RF Section



Bottom View of RF Section

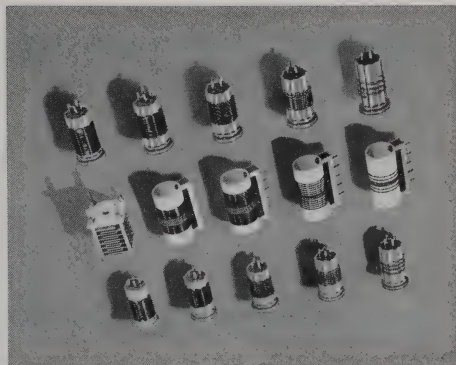


Top View of Modulator

COIL DATA — 55 or 80 WATT TRANS.

Band	L-1 AND L-2			L-3			
	Turns	Winding Length	Wire Size	Turns	Winding Length	Wire Size	Link Turns
160	58	1 $\frac{9}{16}$ "	#22	42	1 $\frac{3}{4}$ "	#18	4
80	30	1 $\frac{3}{8}$ "	#18	42	1 $\frac{3}{4}$ "	#18	4
40	16	1 $\frac{3}{8}$ "	#18	32	2 $\frac{3}{8}$ "	#18	4
20	8	1 $\frac{1}{4}$ "	#18	14	2"	#16	2
10	4	1 $\frac{1}{4}$ "	#18	6	1 $\frac{1}{4}$ "	#16	1

L-1 and L-2 are wound on Hammarlund XP-53 Coil Forms. The coil ends are connected to No. 1 and No. 4 pins. L-2 is center-tapped, the tap being brought out on pin No. 3. L-3 is wound on National XR-13 Coil Forms attached to a PB-5 plug. Link is wound with insulated wire directly over bare wire of plate coil.



Plug-In Coils

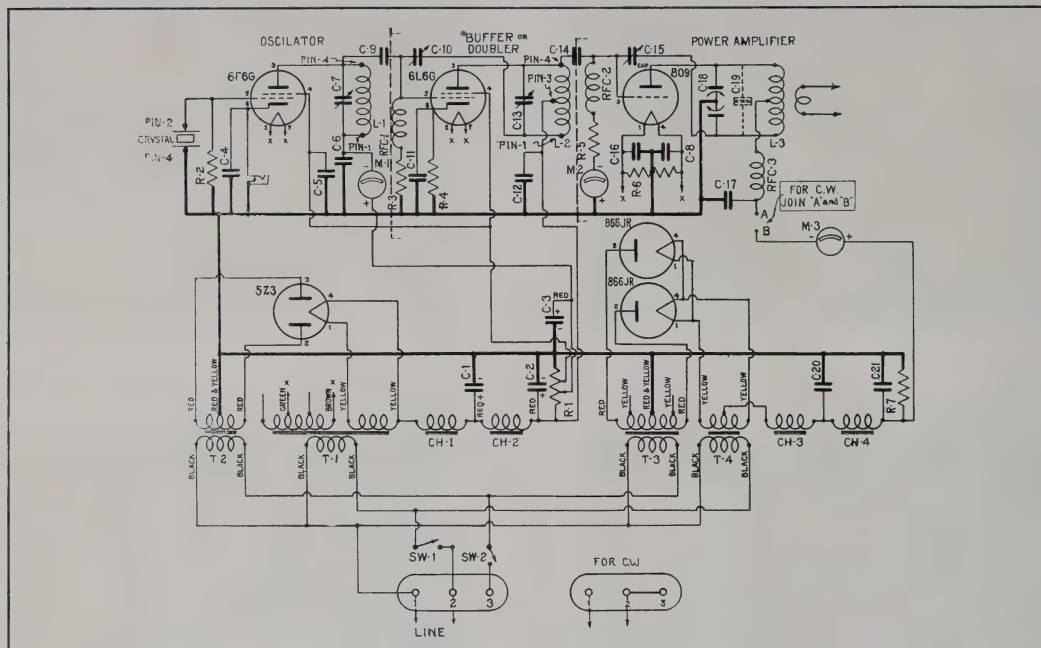


TRANSFORMER SPECIALISTS SINCE 1895



55 Watt Phone, 80 Watt CW Transmitter

RF Section



(Continued from Page 2)

The power supply for the RF unit consists of two rectifier systems, one using a 5Z3 to supply the plates and screen-grids of the two low power stages and the other using a pair of 866-JR's to supply the plate of the final amplifier. The power supply on the modulator chassis uses a 5Z3. On each chassis there is a separate filament supply. On the RF chassis and on the modulator chassis there are two switches, one for the filament supply and one for the plate supply. Thus, one unit can be operated independently of the other. When using the RF unit alone for CW operation, join terminals No. 2 and No. 3 and connect the 115 volt supply line to terminals No. 1 and No. 2. In this condition of operation SW-1 controls the filaments and SW-2 controls the plate supplies. For phone operation, in which it is desired that a single switch operate all plate supplies, connect the 115 volt supply line to terminals No. 4 and No. 5 on the modulator chassis; then connect terminals No. 1, No. 2 and No. 3 on the modulator to their respectively numbered terminals on the RF chassis. On the RF chassis, close SW-1 and SW-2. Then, on the modulator chassis, SW-1 controls all the plate supplies.

Parts Required

THORDARSON TRANSFORMERS and CHOKES:

T-1	T-19F76	Filament Transformer
T-2	T-19P54	Plate Transformer
T-3	T-19P56	Plate Transformer
T-4	T-19F88	Filament Transformer
CH-1	T-19C39	Input Choke
CH-2	T-19C46	Smoother Choke
CH-3	T-57C53	Filter Choke
CH-4	T-57C53	Filter Choke

Resistors:

R-1	7,500 Ohm 50 Watt Resistor
R-2	50,000 Ohm 1 Watt Resistor
R-3	50,000 Ohm 10 Watt Wirewound Resistor
R-4	350 Ohm 10 Watt Wirewound Resistor
R-5	3,500 Ohm 10 Watt Wirewound Resistor
R-6	20 Ohm 10 Watt Center Tapped Resistor
R-7	20,000 Ohm 50 Watt Wirewound Resistor

Condensers:

C-1	4 Mfd. 600 Volt Condenser
C-2	4 Mfd. 475 Volt Condenser
C-3	4 Mfd. 475 Volt Condenser
C-4	.002 Mfd. 1,000 Volt Mica Condenser
C-5	.002 Mfd. 1,000 Volt Mica Condenser
C-6	.002 Mfd. 1,000 Volt Mica Condenser
C-7	100 Mmfd. Variable Condenser
C-8	.001 Mfd. 1,000 Volt Mica Condenser
C-9	.0001 Mfd. 1,000 Volt Mica Condenser
C-10	Neutralizing Condenser
C-11	.002 Mfd. 1,000 Volt Mica Condenser
C-12	.002 Mfd. 1,000 Volt Mica Condenser
C-13	100 Mmfd. Variable Condenser
C-14	.0001 Mfd. 1,000 Volt Mica Condenser
C-15	Neutralizing Condenser
C-16	.001 Mfd. 1,000 Volt Mica Condenser
C-17	.001 Mfd. 2,500 Volt Mica Condenser
C-18	100-100 Mmfd. Variable Condenser
C-20	2 Mfd. 1,000 Volt Oil Filled Condenser
C-21	2 Mfd. 1,000 Volt Oil Filled Condenser

RF CHOKES:

3	RF Chokes
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Miscellaneous Parts:

1	Chassis 17" x 12" x 4" (Punched & Drilled)
1	Panel 10 1/2" x 19" (Punched & Drilled)
1 Pr.	Chassis Mounting Brackets
5	5-Contact Socket
2	Octal Sockets
2	4-Contact Isolantite Sockets
2	4-Contact Sockets
2	Feed-thru Bushings
10	Stand-off Insulators
2	Coil Forms, 4-Prong
1	Phone Jack, Circuit Closing
2	SPST Switches
1	Grid Grip
3	Dials, 2 1/4" Diameter
1	Coil Form
1	Coil Form Plug
1	Base for PB-5 Plug
1	Name Plate Marked "OSCILLATOR"
1	Name Plate Marked "POWER AMP. GRID"
1	Name Plate Marked "POWER AMP. PLATE"

Miscellaneous nuts, bolts, solder and mounting lugs, lock-washers and other hardware.

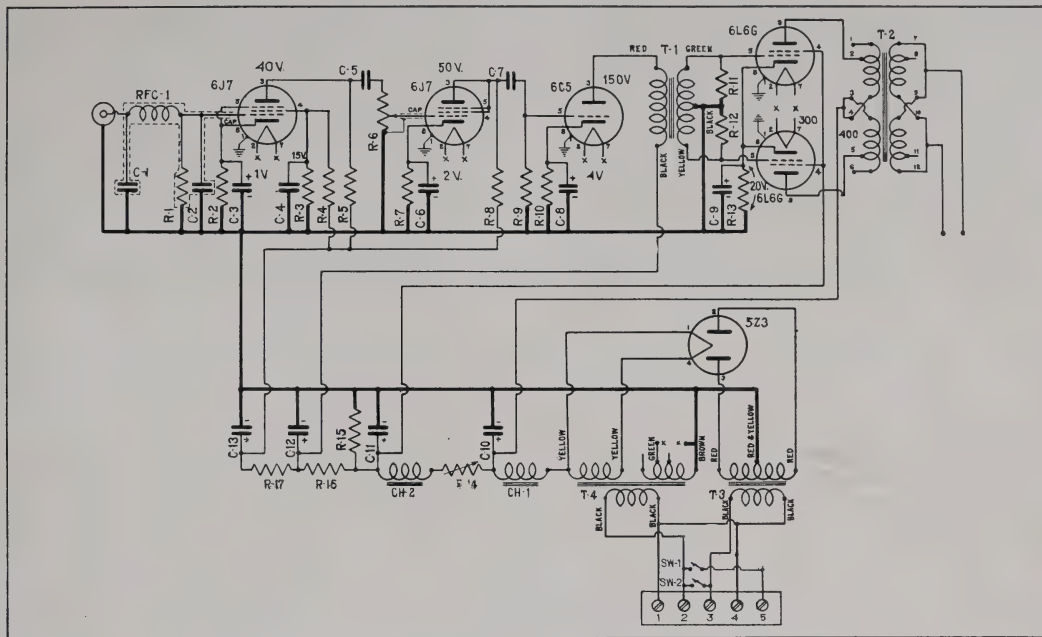
Accessories:

1	Coil Form per band National XR13 or Equiv.
1	Coil Form Plug per band National PB-5 or Equiv.
2	Coil Forms per band Hammarlund XP-53 or Equivalent
1	150 MA DC Meter, 2" Square Case, No Illumination, Triplett 227-A or Equivalent
1	100 MA DC Meter, 2" Square Case, No Illumination, Triplett 227-A or Equivalent
1	250 MA DC Meter, 2" Square Case, No Illumination, Triplett 227-A or Equivalent
1	Cabinet
1	Crystal
1	6F6-G Tube
1	6L6-G or 6L6 GX Tube
1	523 Tube
1	866-JR Tubes
1	Jack Base Cardwell JB
1	80 Mmfd. Fixed Air Condenser (C-19) Cardwell JD-80-OS (Used only on 160 Meters)

Complete kit of the above parts with large size circuit diagram available from your local Thordarson distributor. (Accessories not included in kit).

55 Watt Phone, 80 Watt CW Transmitter

Modulator Section



Parts Required

THORDARSON TRANSFORMERS and CHOKES:

T-1	T-74A31	Push-pull Input Transformer	1
T-2	T-19M14	Modulation Transformer	1
T-3	T-19P54	Plate Transformer	1 Pr.
T-4	T-19F76	Filament Transformer	2
CH-1	T-17C00-B	Filter Choke	5
CH-2	T-13C27	Filter Choke	1

Resistors:

R-1	5 Megohm	1/4 Watt Resistor
R-2	5,000 Ohm	1/4 Watt Resistor
R-3	25,000 Ohm	1 Watt Resistor
R-4	250,000 Ohm	1/4 Watt Resistor
R-5	500,000 Ohm	1/2 Watt Resistor
R-6	1 Megohm	Volume Control
R-7	2,500 Ohm	1 Watt Resistor
R-8	100,000 Ohm	1 Watt Resistor
R-9	250,000 Ohm	1/4 Watt Resistor
R-10	1,000 Ohm	1 Watt Resistor
R-11	50,000 Ohm	1 Watt Resistor
R-12	50,000 Ohm	1 Watt Resistor
R-13	150 Ohm	25 Watt Resistor
R-14	2,500 Ohm	25 Watt Semi-Variable Resistor
R-15	12,000 Ohm	25 Watt Resistor
R-16	20,000 Ohm	1 Watt Resistor
R-17	20,000 Ohm	1 Watt Resistor

Condensers:

C-1	.0001 Mfd.	500 Volt Mica Condenser
C-2	.0001 Mfd.	500 Volt Mica Condenser
C-3	10 Mfd.	25 Volt Condenser
C-4	.03 Mfd.	400 Volt Condenser
C-5	.1 Mfd.	400 Volt Paper Condenser
C-6	10 Mfd.	25 Volt Condenser
C-7	.1 Mfd.	400 Volt Condenser
C-8	10 Mfd.	25 Volt Condenser
C-9	10 Mfd.	50 Volt Condenser
C-10	8 Mfd.	500 Volt Condenser
C-11		
C-12	Triple 8 Mfd.	450 Volt Condenser
C-13		

RF Choke:

RFC-1 RF Choke

Miscellaneous Parts:

Chassis 17" x 10" x 2" (Punched and Drilled)	2
Panel 19" x 7" (Punched and Drilled)	2
5-Lug Terminal Board	1
Chassis Mounting Brackets	1
Feed-thru Bushings	1
Octal Sockets	1
4-Contact Socket	1
Dial Plate Marked "GAIN"	1
Microphone Input Plug	1
Microphone Input Plug Shield	1

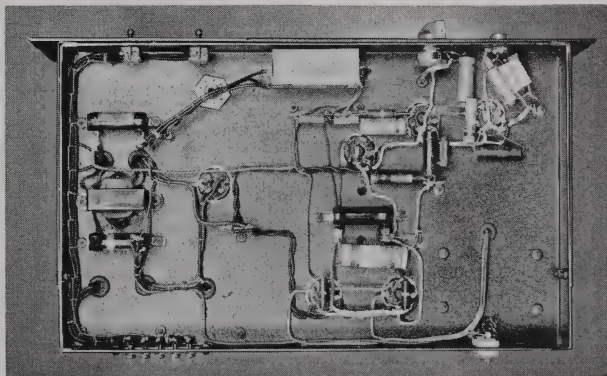
Miscellaneous Parts: (Cont.)

SPST Switches	2
Metal Tube Grid Caps	2
Miscellaneous nuts, bolts, resistor and mounting lugs, lock-washers, and other hardware.	

Accessories:

1 Cabinet	2 6L6-G Tubes
1 Crystal	1 5Z3 Tube
2 6J7 Tubes	
1 6C5 Tube	

Complete kit of the above parts with large size circuit diagram available from your local Thordarson distributor. (Accessories not included in kit).



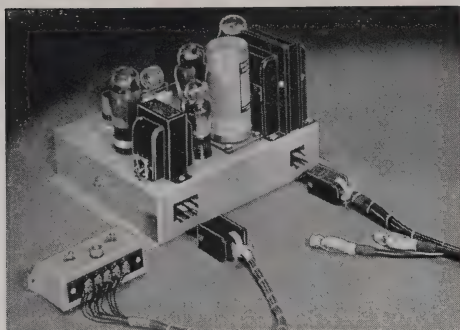
Bottom View of Modulator



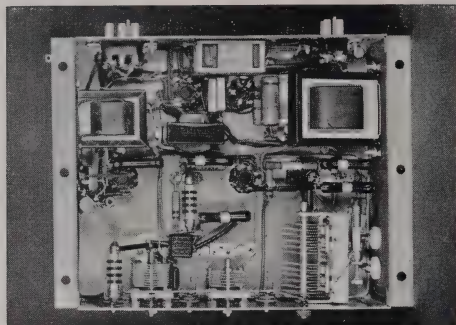
TRANSFORMER SPECIALISTS SINCE 1895



12 Watt Mobile Transmitter for 5-10 Meters



Chassis View



Bottom View

PORTABLE mobile operation on 5 and 10 meters is the distinctive feature of this unit. It is of a rugged chassis type construction especially planned to be used in automobiles. It operates from a 6 volt storage battery using a vibrator power supply which may be remotely controlled from a point several feet away, as for example, a driver's seat.

The RF tube line-up is as follows: a 6V6-G tri-tet crystal oscillator, and a T-21 final amplifier. The oscillator stage operates with a 20 meter crystal, and doubling is carried on in the plate circuit. At no time is operation of the crystal stage "straight through" recommended. The oscillator plate tank is capacity-coupled to the T-21 grid. The T-21 operates "straight through" on 10 meters, and for 5 meter operation doubling in the final is accomplished. The final tank condenser is of the split-stator type. The final amplifier is neutralized in a conventional manner. The cathode tank coil is wound on a 1" form, and the oscillator plate and final plate tank coils are wound on National PB-16 bases with heavy copper wire. Power is taken from the final tank by means of a link.

The power input to the final amplifier plate when it is properly loaded is of the order of 10-12 watts. The final stage cathode current should be between 50 and 55 MA.

Since the transmitter will be operated in an unattended condition, the three variable condenser adjustments are made with a screw driver and then locked with special nuts. The metering of the oscillator cathode current, the final grid current and the final cathode current is done by plugging in an external meter in the jacks provided.

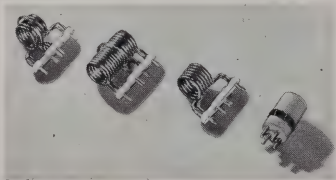
A single 6V6-G tube operates as a Class A amplifier to modulate the T-21 tube. Provision is made for remotely connecting a carbon microphone to the primary of the microphone transformer which is installed on the under side of the chassis. A control with a screw driver adjustment permits the adjustment of the gain of the audio system to the desired amount.

The power supply uses a vibrator having accessible actuating coil terminals. With such a vibrator it is possible to avoid switching the high current which flows in the primary of the

vibrator transformer, and consequently, the control of this vibrator may be done at a distance without the necessity of using connections of high current carrying capacity. The rectifier tube is a 6W5-G. Connections made through socket S-2 to the control box, which may be located at any given convenient place, are such that the closing of switch SW-1 causes the filaments to heat and the current to flow in the microphone circuit. The closing of SW-2 starts the vibrator. Consequently, SW-2 may be used as a stand-by switch. The operator is cautioned against closing SW-2 before the filaments have had time to heat, for the premature closing is likely to damage the 6W5-G.

Separate plugs and sockets are provided for the entrance to the chassis of the power supply and the control wiring. This also aids in keeping vibrator noises out of the microphone circuit. As a further precaution against

(Continued on following page)



Coil	Turns	Wire Size	Diam. of Winding	Winding Length	Supporting Form
L-1	5	No. 16 Enameled	1"	Close Wound	Millen No. 45004 Coil Form
L-2	6	No. 10 Bare	1"	1"	Self-Supporting on National PB-16 Plug
L-3 10 Meters	16 Center-Tapped	No. 10 Bare	1"	2"	Self-Supporting on National PB-16 Plug
L-3 5 Meters	6 Center-Tapped	No. 10 Bare	1"	1"	Self-Supporting on National PB-16 Plug

The link on L-3 is made of 1 turn of No. 14 bare copper wire about 1 1/2" in diameter looped around the center portion of L-3 and supported by the terminal lugs on the PB-16 plug.

12 Watt Mobile Transmitter for 5-10 Meters

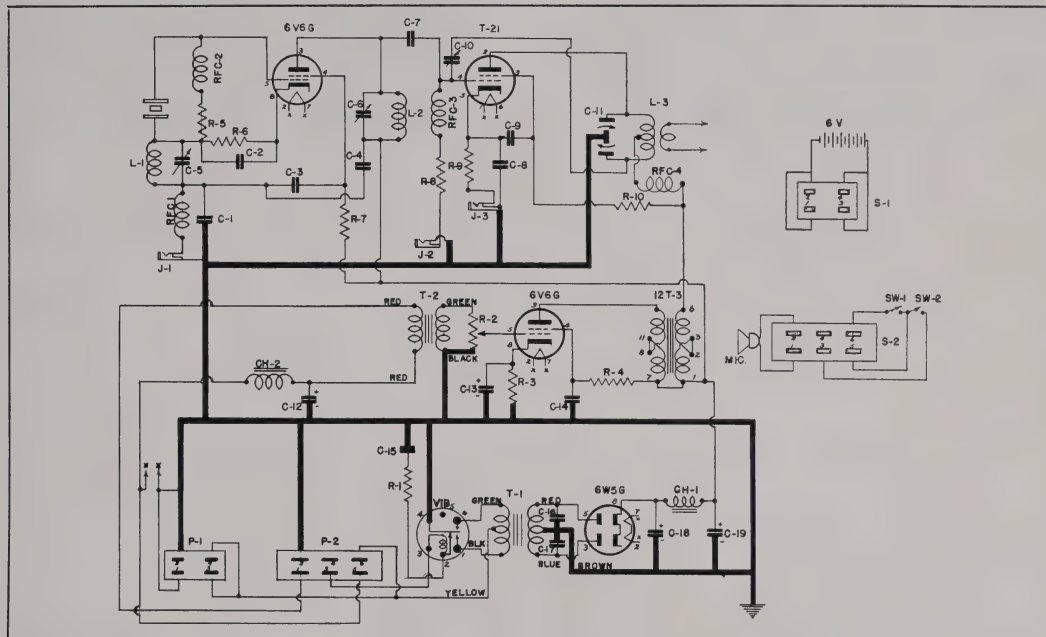
having any vibrator interference in the microphone circuit, any ripple which is superimposed on the leads from SW-1 is effectively filtered out by the CH-2—C-12 filter. All leads carrying current to the 6V primary of the power transformer should be of heavy wire, No. 16 or larger. This measure must be taken so that the full battery voltage is available at the transformer. Similarly, the

wire in the power cable from S-1 to the battery should be large. This precaution also tends to minimize vibrator noise.

The polarity of the battery when connected to the transmitter is not important. However, when installed in an automobile in which one battery serves both the transmitter and the car electrical system, some attention should

be given to the polarity. This is especially necessary if the transmitter chassis is in contact with the frame of the car.

In wiring, careful attention should be given to the placement of leads and chassis connections. Wherever possible the leads carrying vibrator current should not be common with those carrying signal currents.



Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-1	T-14R38	Power Transformer
T-2	T-86A02	Microphone Transformer
T-3	T-19M13	Modulation Transformer
CH-1	T-57C53	Filter Choke
CH-2	T-14C61	Filter Choke

Resistors:

R-1	200 Ohm 1 Watt Resistor
R-2	500,000 Ohm Volume Control
R-3	300 Ohm 10 Watt Resistor
R-4	20,000 Ohm 10 Watt Resistor
R-5	50,000 Ohm 1 Watt Resistor
R-6	350 Ohm 10 Watt Resistor
R-7	12,000 Ohm 10 Watt Resistor
R-8	50,000 Ohm 1 Watt Resistor
R-9	350 Ohm 10 Watt Resistor
R-10	10,000 Ohm 10 Watt Resistor

Condensers:

C-1	.002 Mfd. 500 Volt Mica Condenser
C-2	.01 Mfd. 400 Volt Condenser
C-3	.002 Mfd. 500 Volt Mica Condenser
C-4	.002 Mfd. 500 Volt Mica Condenser
C-5	100 Mmfd. Variable Condenser

Condensers: (Cont.)

C-6	35 Mmfd. Variable Condenser
C-7	.0001 Mfd. 500 Volt Condenser
C-8	.002 Mfd. 500 Volt Mica Condenser
C-9	.002 Mfd. 500 Volt Mica Condenser
C-10	Neutralizing Condenser
C-11	35-35 Mmfd. Variable Condenser
C-12	100 Mfd. 25 Volt Electrolytic Condenser
C-13	10 Mfd. 25 Volt Electrolytic Condenser
C-14	.1 Mfd. 400 Volt Condenser
C-15	.1 Mfd. 400 Volt Condenser
C-16	.05 Mfd. Oil Impregnated Condenser
C-17	.05 Mfd. Oil Impregnated Condenser
C-18	.05 Mfd. Oil Impregnated Condenser
C-19	Double 8 Mfd. 450 Volt Condenser

RF Chokes:

RFC-1	RF Choke
RFC-2	RF Choke
RFC-3	RF Choke
RFC-4	RF Choke

Miscellaneous Parts:

1	Chassis 11" x 8" x 3" (Punched and Drilled)
1	Vibrator Mounting Plate
1	Bottom Plate

Miscellaneous Parts: (Cont.)

1	Control Box
3	Octal Sockets
1	4-Contact Socket, Seatite
1	6-Contact Socket, Seatite
1	6-Contact Socket
1	6-Prong Plug
1	6-Prong Plug
1	6-Contact Socket
1	4-Contact Socket
2	Feed-thru Insulators
2	Coil Sockets
3	Coil Base Plugs
3	Circuit Closing Jacks
1	Crystal Socket
2	4-Prong Coil Forms
6	Resistor Mounting Strips

Miscellaneous nuts, bolts, soldering and mounting lugs, lock-washers and other hardware.

Accessories:

1	Vibrator, Electronics #427 or Equivalent
1	Crystal
1	T-21 Tube
1	6W5-G Tube
2	6V6-G Tubes

Complete kit of the above parts with large size circuit diagram available from your local Thordarson distributor. (Accessories not included in kit).



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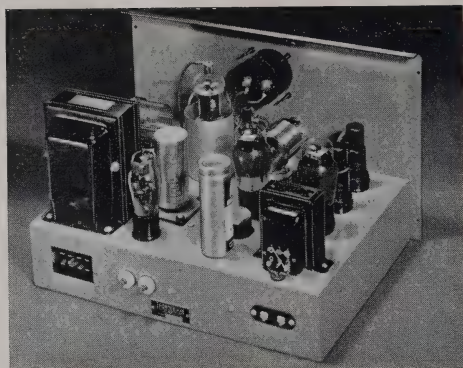


12 Watt Universal Transmitter

FOR PORTABLE AND EMERGENCY SERVICE



Cabinet View



Chassis View

OPERATING on either 115 volts AC or 6 volts DC, this unit not only provides the amateur with an emergency transmitter for battery operation but also may be used as the regular transmitter in the "shack" when so desired. No changes of parts or wiring are necessary for conversion from AC to DC—only the insertion of the proper power plug is required.

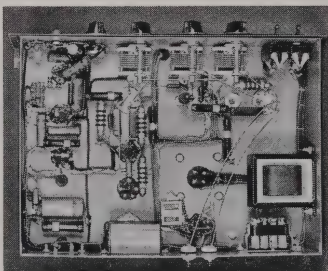
On battery operation 10 to 12 watts input may be obtained, and on AC operation, slightly more than 12 watts input may be expected.

The oscillator tube is a 6V6-G used in a regenerative type circuit having an RF choke in the cathode circuit. The final stage uses an 807 tube.

The final tank circuit consists of two condensers, C-10 and C-11, and a coil, L-2. This tank circuit may be used in the conventional manner by turning C-11 to maximum capacity, in which position a bent rotor plate shorts it out and grounds one side of the link. For settings of C-11 less than full capacity, the 807 is working into a pi network having for its elements C-10, C-11 and L-2. A single-wire antenna may then be connected to the high side of C-11, and the degree of loading may be adjusted by varying C-11 and retuning C-10. In all cases C-10 should be tuned for the minimum plate current, and each re-adjustment of C-11 will require a change of C-10. This provides an easy method of connecting a wide variety of types of single-wire antennas to the transmitter and quickly adjusting to the proper degree of loading. The loading is made greater as the capacity of C-11 is decreased.

A single meter is provided with a switch which permits reading plate current in either the oscillator or the final stage. Because of the excellent shielding and the good circuit layout it was unnecessary to neutralize the 807 tube.

The transmitter may be used on all bands from 160 to 10 meters, and doubling may be accomplished in the crystal stage when using 160, 80 and 40 meter crystals. A closed circuit jack is provided which permits keying the oscillator and amplifier stages simultaneously. Too much grid excitation on the 807 final causes the screen-grid current to become too high. Because the screen-grid voltage is obtained through a dropping resistor, this increase in screen current causes the screen-grid voltage to become low enough that the power output capability of the 807 is reduced. In cases where less excitation is desired, the oscillator tank condenser C-6 may be turned toward its minimum capacity setting.



Bottom View

The modulator is a 6V6-G operating Class A, and the audio amplifier section consists of two 6J7 tubes, pentode connected, providing enough gain for operation with a crystal microphone.

The power supply uses a special vibrator transformer which may be used on either 6 volts DC or 115 volts AC. For AC operation the heater voltage for the tubes is obtained from a transformer winding; and for DC operation the heater voltage is obtained directly from the battery.

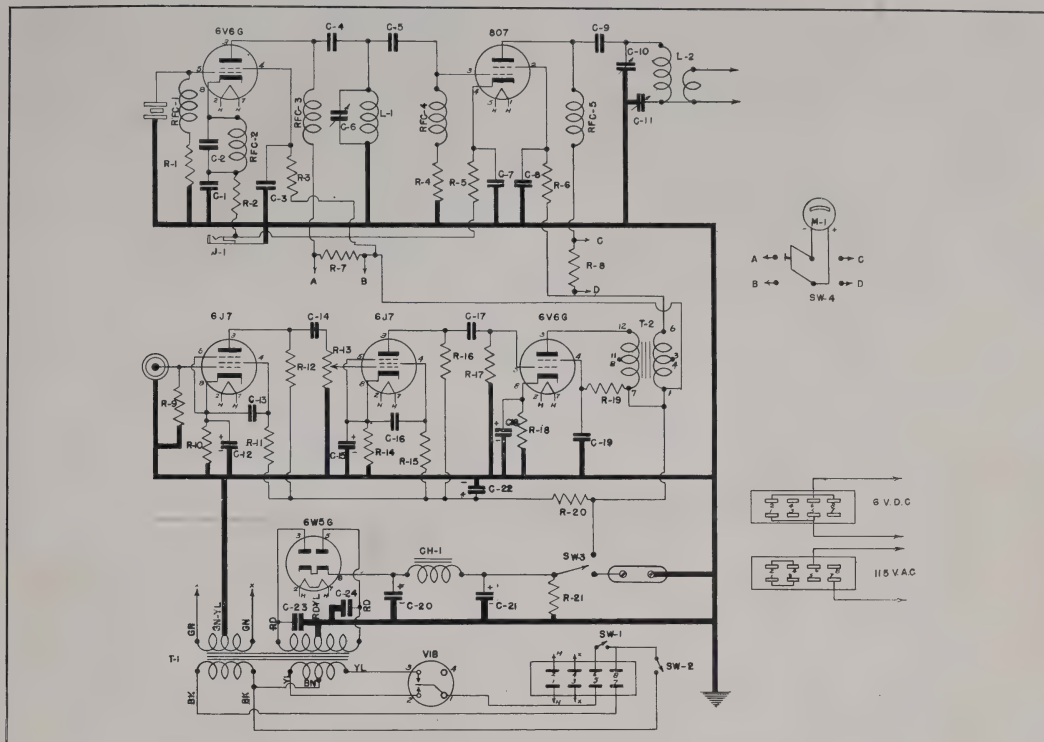
In DC operation the closing of SW-1 causes the filaments to be heated, and the closing of SW-2 causes the vibrator to operate. A short time should be allowed for the heaters to warm up before closing SW-2. Unless such a precaution is taken, there is possibility of damaging the 6W5-G tube.

In AC operation SW-1 should be closed, and the complete power supply is then controlled by SW-2. To provide a source of high voltage DC for the operation of receivers or any other auxiliary equipment, a switch is provided on the meter panel which removes the plate voltage from the tubes in the transmitter and makes it available at a terminal board to which may be connected any other equipment. This switch, SW-3, can then be used as a stand-by switch between transmissions. This source of voltage is available in either AC or DC operation. It is an extremely handy way of supplying the high voltage required for a receiver. Currents up to 100 MA may be drawn from the supply for use on external equipment.

The complete transmitter is mounted in a small metal cabinet and the entire unit, including the cabinet, is finished in gray flat enamel.

12 Watt Universal Transmitter

FOR PORTABLE AND EMERGENCY SERVICE



Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-1	T-14R40	Power Transformer
T-2	T-19M13	Modulation Transformer
CH-1	T-57C53	Filter Choke

Resistors:

R-1	20,000 Ohm 1 Watt Resistor
R-2	350 Ohm 10 Watt Resistor
R-3	15,000 Ohm 10 Watt Resistor
R-4	100,000 Ohm 1 Watt Resistor
R-5	300 Ohm 10 Watt Resistor
R-6	15,000 Ohm 10 Watt Resistor
R-7	50 Ohm 10 Watt Resistor
R-8	50 Ohm 10 Watt Resistor
R-9	5 Megohm 1/2 Watt Resistor
R-10	5,000 Ohm 1 Watt Resistor
R-11	3 Megohm 1/2 Watt Resistor
R-12	500,000 Ohm 1/2 Watt Resistor
R-13	1 Megohm Volume Control
R-14	5,000 Ohm 1 Watt Resistor
R-15	3 Megohm 1/2 Watt Resistor
R-16	500,000 Ohm 1/2 Watt Resistor
R-17	500,000 Ohm 1/2 Watt Resistor
R-18	300 Ohm 10 Watt Resistor
R-19	20,000 Ohm 1 Watt Resistor
R-20	20,000 Ohm 1 Watt Resistor
R-21	30,000 Ohm 20 Watt Resistor

Condensers:

C-1	.01 Mfd. 400 Volt Condenser
C-2	.0001 Mfd. 500 Volt Mica Condenser
C-3	.01 Mfd. 400 Volt Condenser
C-4	.002 Mfd. 1,000 Volt Mica Condenser
C-5	.0001 Mfd. 500 Volt Mica Condenser
C-6	100 Mmfd. Variable Condenser
C-7	.002 Mfd. 500 Volt Mica Condenser
C-8	.002 Mfd. 500 Volt Mica Condenser

Condensers: (Cont.)

C-9	.002 Mfd. 1,000 Volt Mica Condenser
C-10	100 Mmfd. Variable Condenser
C-11	100 Mmfd. Variable Condenser
C-12	10 Mfd. 25 Volt Electrolytic Condenser
C-13	.04 Mfd. 400 Volt Condenser
C-14	.04 Mfd. 400 Volt Condenser
C-15	10 Mfd. 25 Volt Electrolytic Condenser
C-16	.04 Mfd. 400 Volt Condenser
C-17	.04 Mfd. 400 Volt Condenser
C-18	10 Mfd. 25 Volt Electrolytic Condenser
C-19	.5 Mfd. 400 Volt Condenser
C-20	4 Mfd. 600 Volt Condenser
C-21	Double 8 Mfd. 450 Volt Condenser
C-22	.05 Mfd. 1,600 Volt Condenser
C-23	.05 Mfd. 1,600 Volt Condenser
C-24	.05 Mfd. 1,600 Volt Condenser

RF Chokes:

RFC-1	RF Choke	RFC-4	RF Choke
RFC-2	RF Choke	RFC-5	RF Choke
RFC-3	RF Choke		

Miscellaneous Parts:

1	Chassis 10" x 14" x 3" (Punched and Drilled)
1	Panel (Punched and Drilled)
1	Cabinet
1	Vibrator Mounting Plate
3	Feed-thru Insulators
3	5-Contact Sockets
5	Octal Sockets
1	4-Contact Socket
1	5-Contact Socket
2	DPST Switches
1	SPDT Switch
1	DPDT Switch
1	Phone Jack, Circuit Closing

Miscellaneous Parts: (Cont.)

1	Plug
2	Sockets
1	Mic. Plug
1	Mic. Plug Shield
4	Knobs
1	Name Plate Marked "A.F. GAIN"
1	Name Plate Marked "CRYSTAL OSC. PLATE"
2	Name Plates Marked "POWER AMP. PLATE"
1	Name Plate Marked "SEND-RECEIVER"
1	Name Plate Marked "PLATE VOLTS"
1	Name Plate Marked "KEY"
1	Name Plate Marked "PLATE CURRENT"

Miscellaneous nuts, bolts, soldering lugs, lock-washers, grommets and other hardware.

Accessories:

1	Vibrator Mollory 825 or Equivalent
1	0-100 MA DC Meter 2" Square Case Triplett 227A or Equivalent
1	Crystal
1	6W5-G Tube
2	6V6-G Tubes
2	6J7 Tubes
1	807 or HY61/807 Tube
2	160 Meter RF Coils, End Linked, No Tap, Bud OEL-160, or Equivalent
2	80 Meter RF Coils, End Linked, No Tap, Bud OEL-80, or Equivalent
2	40 Meter RF Coils, End Linked, No Tap, Bud OEL-40, or Equivalent
2	20 Meter RF Coils, End Linked, No Tap, Bud OEL-20, or Equivalent
2	10 Meter RF Coils, End Linked, No Tap, Bud OEL-10, or Equivalent

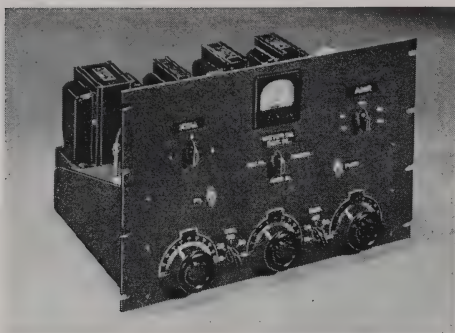
Complete kit of the above parts with large size circuit diagram available from your local Thordarson distributor. (Accessories not included in kit).



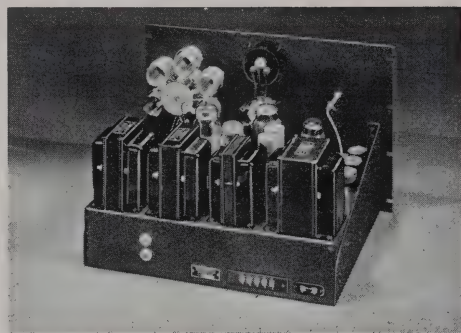
TRANSFORMER SPECIALISTS SINCE 1895



40 Watt Band-Switch Exciter



Panel View



Chassis View

This 40 watt exciter operates on the five amateur bands from 160 to 10 meters, all bands being selected by switches on the panel. The operator has the choice of three crystal frequencies, which may provide operation on all bands or at slightly different points in the same band.

The exciter is a three-stage unit using a 6V6-G crystal oscillator, a 6L6-G buffer-doubler and an 807 final amplifier. The exciter is built on a 17" x 13" x 4" chassis, complete with its filament and high voltage power supplies. It is supplied with a specially prepared 19" x 12 1/4" panel designed to harmonize with the many high power units with which it may be associated. The panel is finished in black with white lettering opposite all switches and dials. No additional markings or lettering are necessary. The position of each coil switch is clearly shown. The chassis is equipped with a five-lug terminal board so that connections can be made for controlling high voltage power supplies and filament supplies for other units by means of the switches on this chassis.

Circuit Details

The 6V6-G crystal oscillator is of the regenerative type having an RF choke in its cathode circuit. The oscillator plate tank coil is a Barker and Williamson type 2AB, which may be tuned with one condenser to all five frequency bands. This tank coil is divided into five sections, and the switching is such that all five sections are used for 160 meters; and only one section for 10 meters. The shorting switch on this coil is such that not only are the unused portions of the coil shorted out, but the unused portion adjacent to the one in operation is independently and directly shorted out. This feature reduces the losses due to shorted turns.

The oscillator stage operates with a plate voltage of 350 volts and a screen

voltage of 180 volts. When loaded by the buffer-doubler stage, the oscillator plate current is about 20 to 25 MA. For 10 meter operation best results are obtained by using a 20 meter crystal, although quadrupling from 40 meters may also be easily carried out in the buffer-doubler. The crystals are mounted on the chassis with very short leads to the grid circuit. Crystal switching is accomplished by means of a flexible shaft connected to the crystal switch on the panel. This allows the crystal to be well placed to avoid undesirable electrical effects and also permits the crystal switch to be placed in a position on the panel which makes operation most convenient.

The buffer-doubler stage uses a 6L6-G with a plate voltage of 400 V. and a screen voltage of 180 V. This stage also has for its plate tank coil a type 2AB coil which covers five bands with one condenser. When loaded down by the grid of the final stage, the buffer-doubler plate current is 35 to 40 MA. With excitation on any band from 160 to 20 meters the buffer-doubler stage very efficiently doubles. With excitation on 160, 80 and 40 meters, quadrupling may be accomplished in this stage. Although the 6L6-G is not neutralized, the amount of feedback is so low that the stage may be worked "straight through" on 160 meters.

The final amplifier stage uses an 807 and operates with 400 volts on the plate and 270 volts on the screen. A power input of 40 watts may be obtained under such conditions, and the power output is of the order of 25 watts. The excitation to this stage should be adjusted so that the grid current is 5 to 10 MA. Care should be taken not to overdrive this beam power tube, for in such a case the plate efficiency decreases. Usually more than enough excitation is obtainable, and the reduction of excitation to this stage may be accomplished by slightly detuning the buffer-doubler tank. The

cathode bias on the buffer-doubler stage prevents the current from rising to abnormal values when detuning. The final plate coil is of turret type construction; and the turret has mounted upon it a coil for each of the five bands, each coil with its associated link. Provision is made for shorting out the four unused coils and their links. The final tank condenser is of the split-stator type with the rotor grounded. It was not found necessary to neutralize the final amplifier.

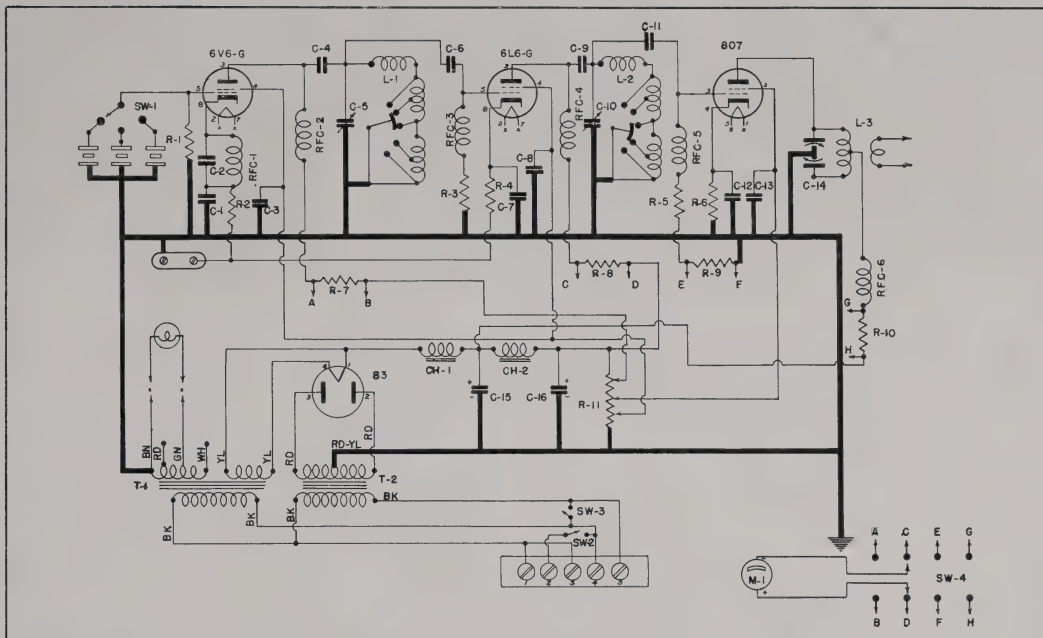
The power supply uses an 83 rectifier, and the power transformer is conservatively rated. Filament and plate supplies may be switched separately from the front of the panel. The switches are plainly marked on each panel.

The oscillator tank and buffer tank coils are mounted with their axes at right angles to each other to avoid any interaction. The final tank coil is mounted above the chassis, and no coupling exists from the final coil to any of the low power stages.

The power output is sufficient to excite Class C stages having inputs as high as 250 to 400 watts. A single meter on the panel and its associated switch provide current readings in the following circuits: crystal oscillator plate, buffer-doubler plate, final amplifier grid and final amplifier plate.

The chassis construction is so arranged as to provide for an increase in power output by changing to the circuit shown for the 120 watt band switching exciter. Knock-out holes are made for the addition of rectifier tube sockets, and extra holes are drilled in the chassis to accommodate the dual plate transformer and the T-19F77 filament transformer required because of the additional 866-JR filament load. Space is provided on the under side of the chassis for the mounting of the high voltage condensers used to filter the output of the 866-JR's.

40 Watt Band-Switch Exciter



THORDARSON TRANSFORMERS and CHOKES

T-1	T-19F76	Filament Transformer
T-2	T-94P60	Plate Transformer
CH-1	T-75C51	Filter Choke
CH-2	T-75C51	Filter Choke

Resistors:

R-1	20,000 Ohm 1 Watt Resistor
R-2	350 Ohm 10 Watt Resistor
R-3	100,000 Ohm 1 Watt Resistor
R-4	350 Ohm 10 Watt Resistor
R-5	10,000 Ohm 10 Watt Resistor
R-6	350 Ohm 10 Watt Resistor
R-7	50 Ohm 10 Watt Resistor
R-8	50 Ohm 10 Watt Resistor
R-9	50 Ohm 10 Watt Resistor
R-10	50 Ohm 10 Watt Resistor
R-11	25,000 Ohm 50 Watt Semi-Variable Resistor, Ohmite or Equivalent

Parts Required

Condensers:

C-1	.002 Mfd. 1000 Volt Mica Condenser, CD-4-6D2 or Aerovox 1455
C-2	.0001 Mfd. 1000 Volt Mica Condenser, CD-4-6T1 or Aerovox 1455
C-3	.002 Mfd. 1000 Volt Mica Condenser, CD-4-6D2 or Aerovox 1455
C-4	.002 Mfd. 1000 Volt Mica Condenser, CD-4-6D2 or Aerovox 1455
C-5	100 Mmfd. Variable Condenser, Cardwell ZU-100-AS or Equivalent
C-6	.0001 Mfd. 1000 Volt Mica Condenser, CD-4-6T1 or Aerovox 1455
C-7	.002 Mfd. 1000 Volt Mica Condenser, CD-4-6D2 or Aerovox 1455
C-8	.002 Mfd. 1000 Volt Mica Condenser, CD-4-6D2 or Aerovox 1455
C-9	.002 Mfd. 1000 Volt Mica Condenser, CD-4-6D2 or Aerovox 1455
C-10	100 Mmfd. Variable Condenser, Cardwell ZU-100-AS or Equivalent
C-11	.0001 Mfd. 1000 Volt Mica Condenser, CD-4-6T1 or Aerovox 1455
C-12	.002 Mfd. 1000 Volt Mica Condenser, CD-4-6D2 or Aerovox 1455
C-13	.002 Mfd. 1000 Volt Mica Condenser, CD-4-6D2 or Aerovox 1455
C-14	260-260 Mfd. Variable Condenser, Cardwell MX-260-BD or Equivalent
C-15	8 Mfd. 600 Volt Electrolytic Condenser, Mallory HS-698 or Equivalent
C-16	8 Mfd. 600 Volt Electrolytic Condenser, Mallory HS-698 or Equivalent

Tubes:

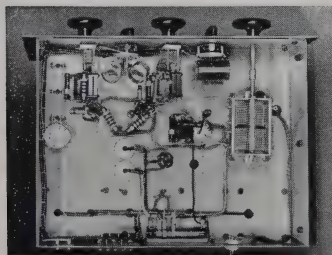
1	6V6-G	Tube
1	6L6-G or 6L6 GX	Tube
1	807 or HY61/807	Tube
1	83	Tube

RF Chokes:

RFC-1	RF Choke, Millen #34101 or Equiv.
RFC-2	RF Choke, Millen #34101 or Equiv.
RFC-3	RF Choke, Millen #34100 or Equiv.
RFC-4	RF Choke, Millen #34101 or Equiv.
RFC-5	RF Choke, Millen #34100 or Equiv.
RFC-6	RF Choke, Millen #34100 or Equiv.

Miscellaneous Parts:

1	Punched Chassis 17" x 13" x 4"
1	Panel 19" x 12 3/4"
1 Pr.	Chassis Mounting Brackets
1	Condenser Mounting Bracket
2	Bushings
2	Octal Sockets
1	4-Contact Socket
1	5-Contact Socket, Steatite
3	4-Contact Sockets, Steatite
2	Feed-thru Insulators
1	Grid Grip
3	Crystal Sockets, Millen #33002 or Equiv.
1 SW-1	Single Pole 4-Throw Switch, Isolantite, Centralab 2542 or Equivalent
1 SW-2	SPST Switch, Arrow H & H #20994
1 SW-3	SPST Switch, Arrow H & H #20994 or Equivalent
1 SW-4	2-Pole 4-Throw Switch, Isolantite, Centralab 2543 or Equivalent
1 L-1	Band Switch Coll, B-W Type 2AB or Equivalent
1 L-2	Band Switch Coll, B-W Type 2AB or Equivalent
1 L-3	Baby Turret, B-W Type BTCL
1 M-1	0-200 MA DC Meter, 3" Square Case, Rear Illumination, Triplett #327A or Equivalent
1	Grid Grip, National Type 24 or Equiv.
3	Control Wheels 2 1/4" Diameter, Coto CI-45 or Equivalent
5	Knobs, Crowe #588 or Equivalent
1	Tube Shield, Hammarlund Type PTS or Equivalent
1	Shaft Extension, Yaxley #RS-242
1	Panel Bearing Assembly, Johnson #256 or Equivalent
1	Shaft Coupling, National TX-11
	Miscellaneous screws, nuts, bolts, lock-washers required hook-up wire and other hardware.



Bottom View

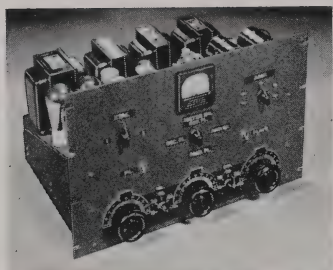
Circuit diagram, drawings and full size template of chassis available from Thordarson 15 cents net each, postpaid.



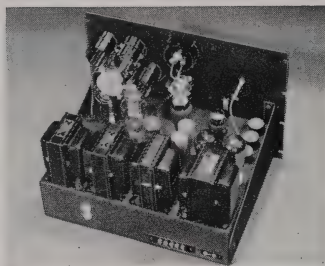
TRANSFORMER SPECIALISTS SINCE 1895



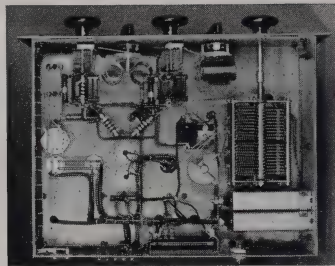
120 Watt Band-Switch Exciter



Panel View



Chassis View



Bottom View

FOR transmitters having inputs as high as 700 or 800 watts this exciter provides adequate excitation on all bands from 160 to 10 meters without the necessity of plugging in different coils. Three crystal frequencies and five operating bands may be selected at will by means of controls on the panel.

The exciter uses for its final amplifier an 811 tube operating at a plate voltage of 1000 volts. The power input to the final stage is 120 watts, and power outputs of over 70 watts may be realized on all bands.

The panel is an especially designed unit requiring no additional name plates or markings. It is finished in black with white lettering, and the position of each control is clearly indicated.

The chassis and panel are the same as those used on the 40 watt band switching exciter. For converting the 40 watt unit to this 120 watt unit it is necessary only to replace the filament plate transformers, to add two filter condensers, a neutralizing condenser and a bleeder resistor; and to replace the final tank circuit with a larger unit. The same convenience of operation and attractive appearance will be retained by the amateur who wishes to increase the power output of his exciter without obsoleting the smaller equipment.

The crystal oscillator stage uses a 6V6-G tube operating with a plate voltage of 350V. and a screen-grid voltage of 190V. This stage drives a buffer-doubler stage with a 6L6-G tube operating at a plate voltage of 400V. and a screen-grid voltage of 275V. This buffer-doubler stage provides adequate excitation to the 811 grid on all bands.

The crystal oscillator stage operates with crystals in any band from 160 to 10 meters. When using crystals in the 160, 80 and 40 meter bands, doubling may be accomplished in the oscillator; and enough output is available from it to drive the 6L6-G buffer-doubler stage easily. When working "straight through" in the crystal oscillator stage, the plate current is of the order of 20 to 25 MA when loaded with the grid of the buffer-doubler stage. The buffer-doubler stage may be operated "straight through," or it may be used to double. With grid excitation on 160, 80, 40 and 20 meters, doubling is easily accomplished in this stage with enough power output to excite the 811 final stage easily. With excitation on 160, 80 and 40 meters, quadrupling can be carried on to give good outputs on 40, 20 and 10 meters.

Although the buffer-doubler stage is not neutralized, no difficulties will be encountered when operating "straight through." However, for best results, it is recommended that wherever possible frequency multiplication be accomplished in this stage.

The oscillator and buffer-doubler plate tank coils are sectionalized and mounted on a switch so that the amount of the coil being used can be easily controlled from the panel. It is thus possible to tune to all five bands with a single condenser. These tank coils are of the type in which the unused winding is short circuited.

The buffer-doubler stage is capacity coupled to the 811 grid. At resonance, and when loaded by the final grid, the plate current in the buffer-doubler stage is of the order of 55 to 60 MA.

The final tank circuit consists of a split-stator condenser and a Barker-Williamson type BCL turret assembly. This coil assembly consists of five coils, one for each frequency band. The coil

which is desired may be selected from the panel, and the other four coils with their links shorted out.

The 811 tube is neutralized in a conventional manner, and no difficulty is encountered in obtaining perfect neutralization.

Since it is a high mu tube, the 811 requires no bias to protect it in the event of failure of excitation. In this exciter grid leak bias is used. With proper excitation the grid current should be 30 to 35 MA.

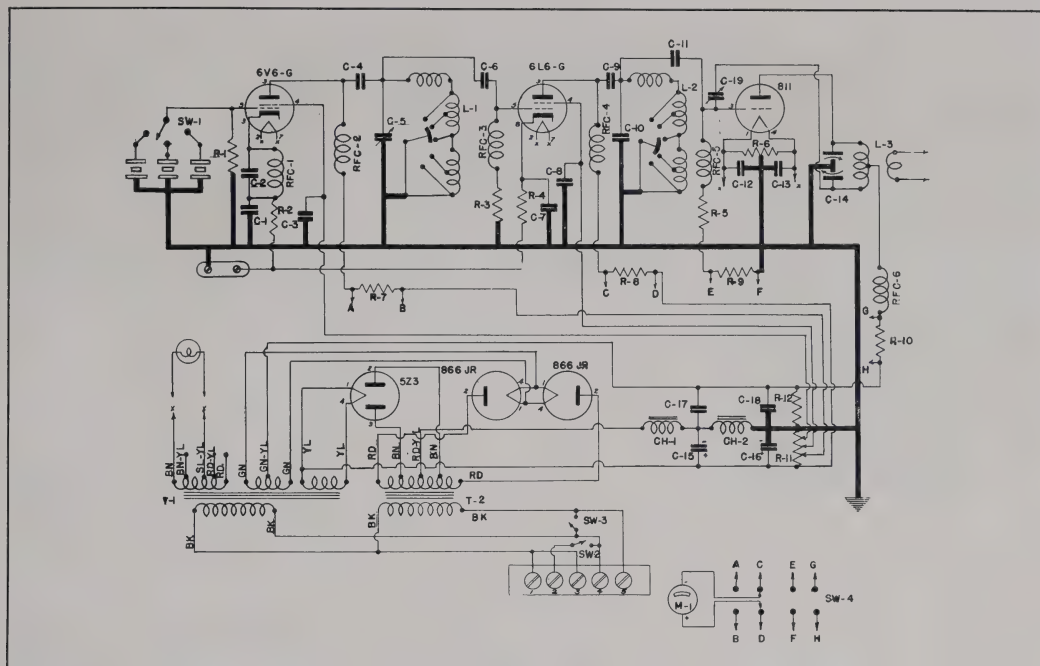
Two DC power supplies are mounted upon this chassis, one delivering 400 volts to supply the oscillator and buffer-doubler stages and the other delivering 1000 volts to the 811 tube. The low voltage rectifier uses a 5Z3 tube, and the high voltage rectifier uses two 866-JR tubes. These power supplies are filtered with the same chokes.

Filament supplies for the RF tubes and for the rectifier tubes are controlled by a single switch on the panel, and the two high voltage supplies by another switch. The terminal board on the rear of the chassis has three extra terminals so that other units associated with this exciter may be controlled by the exciter switches.

A single meter is mounted upon the panel, and under it a four-position switch permits the reading of the oscillator plate current, the buffer-doubler plate current, the final amplifier grid current and the final amplifier plate current.

The three crystal sockets are mounted on the chassis base. The selector switch is coupled to the panel switch by means of a flexible shaft, thus permitting the crystals to be located for best performance and retaining a convenient switch position on the panel.

120 Watt Band-Switch Exciter



Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-1	T-19F77	Filament Transformer
T-2	T-19P57	Plate Transformer
CH-1	T-75C51	Filter Choke
CH-2	T-75C51	Filter Choke

Resistors:

R-1	20,000 Ohm 1 Watt Resistor
R-2	350 Ohm 10 Watt Resistor, Ohmite Brown Devil or Equivalent
R-3	100,000 Ohm 1 Watt Resistor
R-4	350 Ohm 10 Watt Resistor, Ohmite Brown Devil or Equivalent
R-5	2,500 Ohm 10 Watt Resistor, Ohmite Brown Devil or Equivalent
R-6	20 Ohm 10 Watt Center Tapped Resistor, Ohmite Brown Devil or Equivalent
R-7	50 Ohm 10 Watt Resistor, Ohmite Brown Devil or Equivalent
R-8	50 Ohm 10 Watt Resistor, Ohmite Brown Devil or Equivalent
R-9	50 Ohm 10 Watt Resistor, Ohmite Brown Devil or Equivalent
R-10	50 Ohm 10 Watt Resistor, Ohmite Brown Devil or Equivalent
R-11	25,000 Ohm 50 Watt Semi-Variable Resistor, Ohmite #0585 or Equivalent
R-12	100,000 Ohm 50 Watt Resistor, Ohmite or Equivalent

Condensers:

C-1	.002 Mfd. 1,000 Volt Mica Condenser, C-D 4-6D2 or Aerovox 1455
C-2	.0001 Mfd. 1,000 Volt Mica Condenser, C-D 4-6T1 or Aerovox 1455
C-3	.002 Mfd. 1,000 Volt Mica Condenser, C-D 4-6D2 or Aerovox 1455
C-4	.002 Mfd. 1,000 Volt Mica Condenser, C-D 4-6D2 or Aerovox 1455
C-5	100 Mmfd. Variable Condenser, Cardwell ZU-100-AS or Equivalent

Condensers: (Cont.)

C-6	.0001 Mfd. 1,000 Volt Mica Condenser, C-D 4-6T1 or Aerovox 1455
C-7	.002 Mfd. 1,000 Volt Mica Condenser, C-D 4-6D2 or Aerovox 1455
C-8	.002 Mfd. 1,000 Volt Mica Condenser, C-D 4-6D2 or Aerovox 1455
C-9	.002 Mfd. 1,000 Volt Mica Condenser, C-D 4-6D2 or Aerovox 1455
C-10	100 Mmfd. Variable Condenser, Cardwell ZU-100-AS or Equivalent
C-11	.0001 Mfd. 1,000 Volt Mica Condenser, C-D 4-6T1 or Aerovox 1455
C-12	.002 Mfd. 1,000 Volt Mica Condenser, C-D 4-6D2 or Aerovox 1455
C-13	.002 Mfd. 1,000 Volt Mica Condenser, C-D 4-6D2 or Aerovox 1455
C-14	210-210 Mmfd. Variable Condenser, Cardwell XT-210-PD or Equivalent
C-15	8 Mfd. 600 Volt Electrolytic Condenser, Mallory HS-693 or Equivalent
C-16	8 Mfd. 600 Volt Electrolytic Condenser, Mallory HS-693 or Equivalent
C-17	2 Mfd. 1,500 Volt Condenser, Mallory TX-808 or Equivalent
C-18	2 Mfd. 1,500 Volt Condenser, Mallory TX-808 or Equivalent
C-19	Neutralizing Condenser, E. F. Johnson #19G45 or Equivalent

Tubes:

1 6V6-G	Tube 1 811	Tube 1 811
1 6L6-G or 6L6GX	Tube 1 5Z3	Tube 1 5Z3
	Tube 2 866-Jr.	Tube 2 866-Jr.

RF Chokes:

RFC-1	RF Choke, Millen #34101 or Equiv.
RFC-2	RF Choke, Millen #34101 or Equiv.
RFC-3	RF Choke, Millen #34101 or Equiv.
RFC-4	RF Choke, Millen #34101 or Equiv.
RFC-5	RF Choke, Millen #34101 or Equiv.
RFC-6	RF Choke, Millen #34101 or Equiv.

Miscellaneous Parts:

1	Punched Chassis 17" x 13" x 4"
1	Panel 19" x 12 1/4"
1 Pr.	Chassis Mounting Brackets
1	Condenser Mounting Bracket
2	Bushings
2	Octal Sockets
1	4-Contact Socket
1	5-Contact Socket, Steatite
3	4-Contact Sockets, Steatite
1	Feed-thru Insulators
1	Grid Grip
3	Crystal Sockets, Millen #33002 or Equiv.
1 SW-1	Single-Pole, 4-Throw Switch, Isolantite, Centralab #2543 or Equivalent
1 SW-2	SPST Switch, Arrow H & H #20992 (Nickel Plated) or Equivalent
1 SW-3	SPST Switch, Arrow H & H #20992 (Nickel Plated) or Equivalent
1 SW-4	2-Pole, 4-Throw Switch, Isolantite, Centralab #2543 or Equivalent
1 L-1	Band Switch Coil, Barker-Williamson Type 2AB or Equivalent
1 L-2	Band Switch Coil, Barker-Williamson Type 2AB or Equivalent
1 L-3	Coil Turret Assembly, Barker-Williamson Type BCL or Equivalent
1 M-1	0-200 MA DC Meter, 2" Square Case, Rear Illumination, Triplett #327-A or Equivalent
3	Control Wheels, 2 1/4" Diameter, Coto CI-45 or Equivalent
5	Knobs, Crowe #588 or Equivalent
1	Shaft Extension, Yaxley #RS-242 or Equivalent
1	Panel Bearing Assembly, Johnson #256 or Equivalent
1	Shaft Coupling, National TX-11
	Miscellaneous nuts, bolts, soldering lugs, lock-washers, varnished tubing, cable and other hardware.

Circuit diagram, drawings and full size template of chassis available from Thordarson 15 cents net each, postpaid.

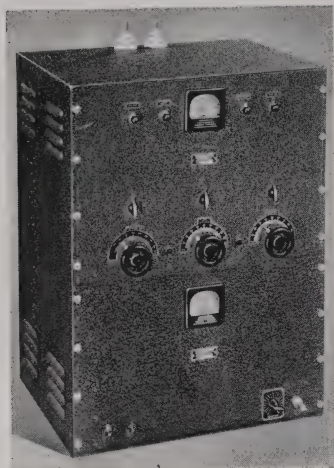


TRANSFORMER SPECIALISTS SINCE 1895



Band-Switch Transmitter

100 WATT MULTI-BAND



Complete Transmitter

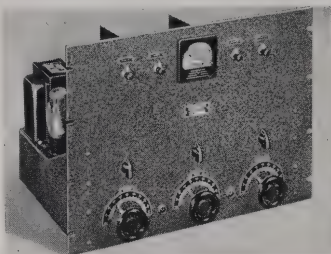
THIS complete 100 watt transmitter consists of two units, each having its own power supply. The RF section may be modulated or may be used for CW only. Its final stage operates at 1000 volts with 100 watts input. The modulator provides sufficient power output to modulate 100% the RF section, and the speech amplifier is incorporated in the modulator chassis.

Any three pre-selected amateur bands in the range from 160 to 10 meters may be selected with panel switches.

The RF section is a three-stage circuit using a 6L6-G oscillator, a 6L6-G buffer-doubler stage and a TZ-40 final stage.

The oscillator stage has provision for switching in its plate tank circuit any one of three coils, and the same switching operation which selects the coils also selects the proper crystal. With 160 and 80 meter crystals, doubling can be accomplished in the oscillator stage, but crystals in the range from 160 to 20 meters may be used in the oscillator stage when working "straight through."

In the buffer stage provision is made for switching to any one of three tank coils. Because the 6L6-G buffer-doubler tube is not neutralized and since, when the second stage is used in frequency multiplying service, adequate drive is obtained on the TZ-40, it is recommended that doubling be carried on in this stage whenever possible. However, on the lower frequency bands, there is no tendency toward trouble when operating "straight through." In all cases the final stage is operated "straight through." For 10 meter output it is



RF Section

recommended that a 20 meter crystal be used and that doubling be carried on in the second stage.

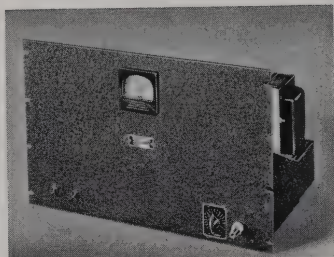
The oscillator stage is capacity coupled to the buffer-doubler stage, and the latter is capacity coupled to the final grid.

Three Barker-Williamson center linked, center tapped tank coils, mounted in a type B coil turret, permit the selection of any one of these coils for use in the final tank. With this arrangement the link around the coil in use is connected to the antenna or to an antenna matching network.

With one meter and four meter switches provision is made for reading the oscillator cathode current, the buffer-doubler cathode current, the final grid current and the final plate current. The meter switches are of such a type that the circuit controlled by each switch may be opened by placing the switch in its "half way" position.

Two direct current supplies are installed in this chassis, one of which delivers approximately 400 volts to supply the plates of the 6L6-G's and the other which delivers 1000 volts to supply the plate of the TZ-40. The screen supply for the 6L6-G's is taken from taps on the 400 volt bleeder R-5, these taps being adjusted so that the voltage on the oscillator screen-grid is about 150 to 200 volts and on the buffer-doubler screen-grid it is about 200 to 250 volts. When the oscillator tube is operating properly, the cathode current should dip to a value of 50 MA or less, and the cathode current in the buffer-doubler stage at resonance, should be about 75 MA. The grid current on the final should be 25 MA or more; and for a 100 watt input to the final stage, the TZ-40 plate current should be 100 MA.

The removal of the high voltage for neutralizing the final stage may be done easily by removing the 866-JR tubes from their sockets and then making the neutralizing adjustment in the conventional manner with the antenna or antenna matching network



Modulator

connected to the link on the final tank coil.

For CW operation the key is connected between terminals 1 and 2 on the five-screw terminal board on the back apron of the chassis, the 115 volt line is connected to terminals 3 and 4 and the plate voltage is controlled by a switch connected between terminals 4 and 5. The terminals of the two No. 55 feed-thru insulators on the rear apron of the chassis are connected together.

Modulator Unit:

The modulator tubes are 6L6-G's in push-pull, Class AB₁. These tubes are connected to the Class C load through a Multi-Match modulation transformer. The connections to the modulation transformer are as follows: One 6L6-G plate is connected to terminal 1, and the other plate to 6. Terminals 2 and 5 are joined and connected to the plate supply. Terminals 9 and 10 are also joined, but no connection is made to them. The Class C load is connected to terminals 8 and 12.

The speech amplifier tube line-up is as follows: a pentode connected 6J7, a 6F5 and a 6F6, triode connected.

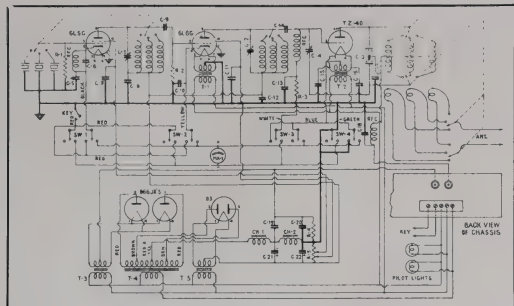
The power supply uses an 83 to supply high voltage to all tubes and an 82 in the bias supply for the 6L6-G's.

In preparing the modulator unit for operation, an adjustment must be made of the bias and the screen voltage on the 6L6-G's. For obtaining the correct bias adjust R-11 until the voltage across it is 25 volts. Then adjust R-12 until the screen voltage is 310 volts. It may be necessary to readjust R-11 to maintain the 25 volts of bias. The modulator plate current should be about 115 MA for two tubes, and with a sine wave signal of sufficient magnitude to modulate 100% the RF section the plate current will rise to approximately 225 MA. For speech waves having the same peak power plate current will kick up to about 170 MA.

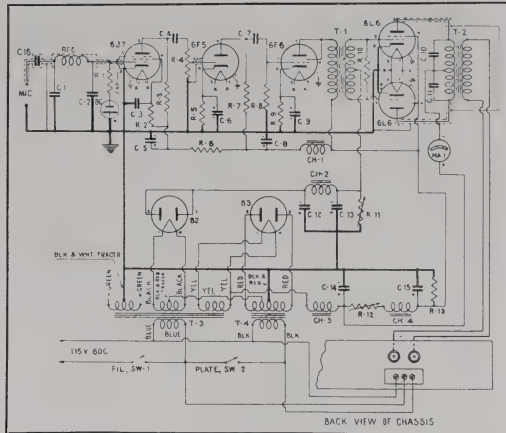
To connect the modulator to the RF section terminals 3, 4 and 5 on the RF

Band-Switch Transmitter

100 WATT MULTI-BAND



RF Unit



Modulator Unit

section should be connected to terminals 1, 2 and 3 on the modulator. Connection should be made from the terminals of the No. 55 feed-thru insulators on the modulator chassis to the corresponding insulators on the RF chassis. With the two chasses so interconnected the filament switch on the modulator chassis controls all the filaments, and the plate switch controls all plate supplies.

The RF section may be used alone as an exciter for transmitters having power inputs of almost one kilowatt.

RF Unit

Condensers: (Cont'd)

- C-12 .005 Mfd. 1000 Volt Mica Condenser, Aero-vox #1455 or C-D 4-6D5
- C-17, C-18 .001 Mfd. 5000 Volt Mica Condenser, Aerovox #1457 or C-D 4-25D1
- C-19, C-20 2 Mfd. 1500 Volt Oil Filled Condenser, Aerovox #1505 (2" Can)
- C-21 4 Mfd. 600 V. Electrolytic, Aerovox GL-600
- C-22 4 Mfd. 600 V. Electrolytic, Aerovox GL-600

Miscellaneous Parts:

- 3 5-Contact Sockets, Amphenol S5
- 5 4-Contact Sockets, Amphenol S4
- 2 Octal Sockets, Amphenol S8
- 4 4-Contact Isolantite Sockets, Amphenol SS4
- 8 Feed-thru Insulators, Johnson #55
- 4 Feed-thru Insulators, Johnson #42
- 3 RF Chokes, National R-100
- 1 4" Shaft Extension, Yaxley #RS243
- 1 2-Gang Band Switch, Centralab #2543
- 1 1-Gang Band Switch, Centralab #2542
- 1 Coil Turret, Barker-Williamson Model "B"
- 1 160 Meter Coil, Barker-Williamson 160BL — Center Linked
- 1 80 Meter Coil, B-W 80BL, Center Linked
- 1 40 Meter Coil, B-W 40BL, Center Linked
- 1 20 Meter Coil, B-W 20BL, Center Linked
- 1 10 Meter Coil, B-W 10BL, Center Linked
- 3 2 1/4" Coto-Coil Wheels CI-45 With Indicator Plates CI-47 Marked "OSC. PLATE", "BUFFER PLATE", "PWR. AMP. PLATE."
- 4 Indicator Plates, Marked "OSC. PLATE", "BUFFER PLATE", "PWR. AMP. PLATE", "PWR. AMP. GRID", Coto-Coil CI-47.
- 4 Meter Switches, Yaxley #762
- 1 0-200 MA Meter, Simpson #27S or Triplett #327-A (Illum.)
- 3 1 1/4" Bar Knobs, Black
- 1 Grid Cap, Large, National Type 12
- 2 SPST 6 Ampere Toggle Switches, H & H #26993
- 6 Coil Forms, National XR-4
- 1 Cone Insulator, Johnson #601
- 1 Cabinet, Bud #697 or Par Metal #SC2613
- 1 Variable Resistor Lug, Ohmite #0358

Modulator Unit

Parts Required

THORDARSON PARTS

- T-17K22 Foundation Unit
- T-1 T-67D78 Driver Transformer
- T-2 T-11M75 CHT Modulation Transformer
- T-3 T-79F84 Filament Transformer
- T-4 T-84P60 Plate Transformer
- CH-1 T-74C30 Third Choke
- CH-2 T-75C49 Bias Choke
- CH-3 T-75C51 First Choke
- CH-4 T-68C07 Second Choke

Modulator Unit

Tubes:

- 1 6J7 Tube
- 2 6L6-G or 6L6-GX Tubes
- 1 6F5 Tube
- 1 6F6 Tube
- 1 83 Tube

Resistors:

- R-1 5 Megohm 1/2 Watt Resistor, IRC BT-1/2
- R-2 3 Megohm 1 Watt Resistor, IRC BT-1
- R-3, R-8 250,000 Ohm 1 Watt Resistor, IRC BT-1
- R-4 500,000 Ohm Volume Control, IRC 13-133
- R-5 2000 Ohm 1 Watt Resistor, IRC BT-1
- R-6 2000 Ohm 1 Watt Resistor, IRC BT-1
- R-7 100,000 Ohm 1 Watt Resistor, IRC BT-1
- R-9 750 Ohm 10 Watt Resistor, IRC Type AB
- R-10 10,000 Ohm 2 Watt Resistor, IRC BT-2
- R-11 1500 Ohm 25 Watt Semi-Variable, Ohmite
- R-12 2500 Ohm 25 Watt Semi-Variable, Ohmite
- R-13 25,000 Ohm 50 Watt Wirewound, Ohmite

Condensers:

- C-1, C-2 .0001 Mfd. 500 Volt Mica Condenser, Aerovox #1467 or C-D 5W-5T1
- C-3 .04 Mfd. 400 Volt Paper Condenser, Aero-vox #484 or C-D DT-4S4
- C-4, C-7 .1 Mfd. 400 Volt Paper Condenser, Aero-vox #484 or C-D DT-4P1
- C-5 8 Mfd. 450 Volt Electrolytic Condenser, Aerovox PBS-450 or C-D JR508
- C-6 10 Mfd. 25 Volt Electrolytic Condenser, Aerovox PR-25 or C-D ED-2100
- C-8 8-8 Mfd. 450 V. Dual Elect., Aerovox 2G C-15
- C-9 10 Mfd. 50 V. Elect., Aerovox PR-50
- C-10, C-11 0.002 Mfd. 1000 Volt Mica Condenser, Aerovox #1455 or C-D 4-6D2
- C-12, C-13 8 Mfd. 200 Volt Electrolytic Condenser, Aerovox PBS-200 or C-D JR208
- C-14 8 Mfd. 600 V. Elect., Aerovox GL-600
- C-16 0.01 Mfd. 400 Volt Paper Condenser, Aero-vox #484 or C-D DT-4S1

Miscellaneous Parts:

- 1 RF Choke, National R-100
- 1 Mic. Connector, Amphenol MC-1F
- 1 Mic. Connector, Amphenol PC-1M
- 1 Bias Cell, Mallory #77
- 1 Bias Cell Holder, Mallory #GB-1A
- 1 1 1/4" Bar Knob, Black Streamlined
- 1 AC Line Cord and Plug, Belden #1725
- 2 Octal Sockets, Amphenol S8
- 2 4-Contact Sockets, Amphenol S4
- 2 Metal Tube Grid Caps
- 1 Dial Plate, Crowe #666
- 2 Feed-thru Insulators, Johnson #55
- 1 0-300 MA Meter, Simpson #27S or Triplett #327-A (Illuminated)
- 2 Metal Tube Shields, ARHCO #92
- 1 Red Jewel and Candelabra Bracket, ARHCO #93 or Drake Mig. Co. #10C
- 1 Green Jewel and Candelabra Bracket, ARHCO #93 or Drake Mig. Co. #10C
- 2 110 Volt Carbon Lamps Type G6

BAND	TURNS	WINDING LENGTH
160	40	Close wound
80	22	Close wound
40	12	1 3/4"
20	6	1 1/2"
10	3 1/2	

Osc. & Buf. coils are identical. Use No. 18E wire on 1 1/2" Diam. form.

RF Unit

Parts Required

THORDARSON PARTS

- T-1 T-17K21 Foundation Unit
- T-2 T-19F97 Filament Transformer
- T-2 T-19F93 Filament Transformer
- T-3 T-19F98 Filament Transformer
- T-4 T-19F67 Plate Transformer
- T-5 T-19F91 Filament Transformer
- CH-1 T-75C51 First Choke
- CH-2 T-75C51 Second Choke

Tubes:

- 2 6L6-G or 6L6-GX Tubes
- 2 866-JR Tubes
- 1 T-40 Tube
- 1 83 Tube

Resistors:

- R-1 50,000 Ohm 1 Watt Resistor, IRC BT-1
- R-2 50,000 Ohm 10 Watt, Ohmite Red Devil
- R-3 2,500 Ohm 25 Watt, Ohmite, Wirewound
- R-4 100,000 Ohm 50 Watt, Ohmite Wirewound
- R-5 20,000 Ohm 50 Watt, Ohmite Semi-Variable

Condensers:

- C-1, C-2 Variable Condenser, National TMS-250
- C-3 Variable Condenser, National TMC-200D
- C-4 Neutralizing Condenser, Johnson 13G45
- C-5, C-7, C-8, C-9, C-10, C-11, C-13, C-14, C-15, C-16 .001 Mfd. 1000 Volt Mica Condenser, Aero-vox #1455 or C-D 4-6D1
- C-6 .0001 Mfd. 1000 Volt Mica Condenser, Aero-vox #1455 or C-D 4-6T1

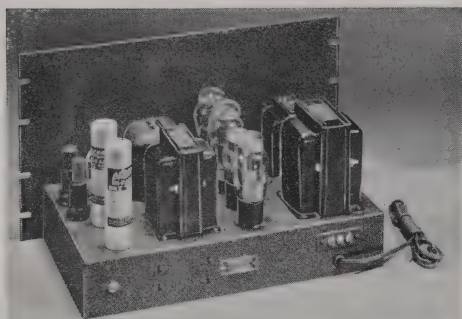
Complete Instruction Book SD-386-A giving full details of building data, photos, diagrams and layout available at 25 cents postpaid.



TRANSFORMER SPECIALISTS SINCE 1895



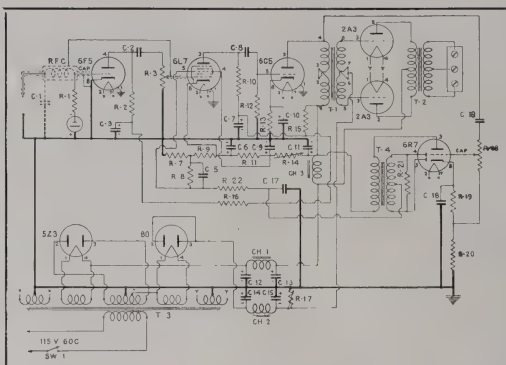
Amateur Speech Amplifier



Chassis View

USING low plate resistance output tubes, this amplifier is capable of easily delivering 10 watts of audio power for driving the largest modulators used by amateurs. Its low internal output impedance provides the excellent regulation required in Class B driver service, and its high gain makes it usable with crystal microphones.

The circuit shown is that incorporating the peak limiting feature, but this amplifier is also available with a circuit for overmodulation control or as a conventional amplifier. The punched chassis is designed to fit either the regular type amateur transformers or the C.H.T. Series of transformers, which give better



frequency response and less distortion. The amplifier may be adapted to rack and panel mounting, or a cover may be obtained for use on an operating table.

For T-2, a driver transformer may be used to couple the 2A3 plates directly to the Class B grids; or, if it is desired to locate the amplifier remotely from the modulator, an output transformer may be installed to couple the 2A3 plates to a 500 ohm line.

Specifications showing the different circuits, together with a complete parts list, are shown on the Thordarson SD-389 bulletin, available at all jobbers.

Thordarson Parts

- | | | |
|------|--|-----------------|
| 1 | T-17K20 | Foundation Unit |
| T-1 | T-15A74 | |
| T-2 | T-16S90 or T-67S54 for 500 ohm output or | |
| | T-15D76, T-15D77, T-15D78 or T-15D79 or | |
| | T-19D01, T-19D02, T-19D03 or T-19D04 | |
| T-3 | T-15R05 or T-87R85 | |
| T-4 | T-78D46 | |
| CH-1 | T-15C54 or T-74C29 | |
| CH-2 | T-75C49 | |
| CH-3 | T-74C30 | |

Tubes:

- | | | | | | | |
|-------|-------|-------|-------|-------|-------|------|
| 1-6F5 | 1-6C5 | 1-5Z3 | 1-6R7 | 1-6L7 | 2-2A3 | 1-80 |
|-------|-------|-------|-------|-------|-------|------|

Resistors:

- | | |
|------|---|
| R-1 | 5 Megohm, 1/2 Watt, IRC BT-1/2 |
| R-2 | 250,000 Ohms, 1 Watt, IRC BT-1 |
| R-3 | 500,000 Ohms, Volume Control, IRC 13-133 |
| R-7 | 350 Ohms, 10 Watts, Ohmite Brown Devil |
| R-8 | 500,000 Ohms 1 Watt, IRC BT-1 |
| R-9 | 150 Ohms, 10 Watts, Ohmite Brown Devil |
| R-10 | 100,000 Ohms, 1 Watt, IRC BT-1 |
| R-11 | 4,000 Ohms 10 Watts, Ohmite Brown Devil |
| R-12 | 250,000 Ohms 1 Watt, IRC BT-1 |
| R-13 | 500 Ohms, 1 Watt, IRC BT-1 |
| R-14 | 12,000 Ohms, 25 Watts, Ohmite Semi-Variable |
| R-15 | 20,000 Ohms, 1 Watt, IRC BT-1 |
| R-16 | 20,000 Ohms, 1 Watt, IRC BT-1 |
| R-17 | 2,500 Ohms, 25 Watts, Ohmite Semi-Variable |
| R-18 | 500,000 Ohms, Volume Control, IRC 13-133 |
| R-19 | 1,000 Ohms, 1 Watt, IRC BT-1 |
| R-20 | 2,500 Ohms, 1 Watt, IRC BT-1 |
| R-21 | 10,000 Ohms, 1 Watt, IRC BT-1 |
| R-22 | 100,000 Ohms, 1 Watt, IRC BT-1 |

Condensers:

- | | |
|------------|--|
| C-1 | 0.0001 Mfd., 500 V Mica Aerovox 1467 or C-D 5W-5T1 |
| C-2 | 0.1 Mfd., 400 V Paper Aerovox 484 or C-D DT-4P1 |
| C-3 | 8 Mfd., 450 V Elect. Aerovox PBS-450 or C-D JR508 |
| C-5 | 0.5 Mfd., 400 V Paper Aerovox 484 or C-D DT-4P5 |
| C-6 | 8 Mfd., 450 V Elect. Aerovox PBS-450 or C-D JR508 |
| C-7, C-11 | 8 Mfd., 450 V Dual Elect. Aerovox 2G |
| C-8 | 0.1 Mfd., 400 V Paper Aerovox 484 or C-D DT-4P1 |
| C-9 | 8 Mfd., 450 V Elect. Aerovox PBS-450 or C-D JR508 |
| C-10 | 10 Mfd., 25 V Elect. Aerovox PR-25 or C-D ED-2100 |
| C-12, C-13 | 8-8 Mfd., 450 V Dual Elect. Aerovox 2G |
| C-14 | 8 Mfd., 200 V Elect. Aerovox PBS-200 or C-D JR208 |
| C-15 | 8 Mfd., 200 V Elect. Aerovox PBS-200 or C-D JR208 |
| C-17 | 0.1 Mfd., 400 V Paper Aerovox 484 or C-D DT-4P1 |
| C-18 | 10 Mfd., 25 V Elect. Aerovox PB-25 or C-D ED-2100 |
| C-19 | 0.1 Mfd., 400 V Paper Aerovox 484 or C-D DT-4P1 |

Miscellaneous Parts:

- | | | | |
|---|--|---|--|
| 1 | Mic. Input Connector, Amphenol MC1F | 1 | SPST Toggle Switch, H & H No. 20992 |
| 1 | Mic. Input Connector, Amphenol PC1M | 1 | AC Line Cord and Plug, Belden No. 1725 |
| 1 | Red Jewel and Bracket, Yaxley No. 310R | 3 | Metal Tube Grid Caps |
| 1 | Bias Cell, Mallory No. F7 | 2 | Metal Tube Shields, ARHCO No. 92 |
| 1 | Bias Cell Holder, Mallory No. GB-1A | 1 | Dial Plate, Crowe No. 566 |
| 1 | 1 1/4" Bar Knob, Black Stream-lined | 1 | RF Choke, National R-100 |
| | | 1 | Octal Sockets, Amphenol S-4 |
| | | 1 | 4-Contact Sockets, Amphenol S-4 |
| | | 1 | 6.3 Volt Pilot Light, Mazda No. 40 |

The parts list shown is for the amplifier with either the over-modulation control or the peak limiting circuits; complete drawings, photos, parts lists and instructions for easy assembly of either of the above circuits are contained in Instruction Book SD-387, 15 cents postpaid.



TRANSFORMER SPECIALISTS SINCE 1895



250 Watt Phone Transmitter

450 WATT CW — 160 TO 10 METERS



High Efficiency Final Stage



Multi-Match Modulator



*1250 and 1500
Volt Power Supply*



*Up to 150 Watts
Modulator Output*



PARTICULARLY designed for use with the new RCA-811 and 812 tubes, this transmitter, with its unusual mechanical layout and carefully planned wiring, gives superior performance on the five amateur bands from 160 to 10 meters. With an input of 250 watts for phone operation, a carrier output of 190 watts is easily obtained; and with 450 watts input for CW, 350 watts may be delivered to the antenna. Higher than usual plate efficiencies are obtained by careful attention to mechanical layout and by the selection of high quality parts.

In addition to the RCA-812 the transmitter will also operate satisfactorily with other tubes such as the Taylor TZ-40, Taylor T-55, or the Eimac 35T. It is only necessary to use the correct filament transformer and to adjust the grid bias resistor.

A semi-fixed swinging link grid tank coil of the plug-in type is used in the grid circuit. This allows not only close adjustment for optimum excitation but also permits the coil to be removed without changing the link setting. This latter feature is particularly desirable for the amateur who wishes to avoid time-consuming operations when changing

bands. The plate tank coil is also of the swinging link type, which permits quick adjustment of the amplifier loading. The Class C amplifier is easily driven by the Thordarson 40 watt Band-Switch Exciter unit, this combination affording the advantage of quick band changing without involving costly coil switching parts in the high power stage.

The Class C amplifier requires 200 MA at 1250 volts for a phone input of 250 watts. For a 450 watt CW input the plate current is 300 MA at 1500 volts. The grid current for the Class C tubes depends upon the choice of tubes and whether CW or phone operation is desired. For 812's it is 50 MA for two tubes. To meet the various bias requirements of the different tube types, an adjustable grid resistor is provided.

Should the amateur wish to install an external fixed bias supply for CW, provision has been made for its easy connection. If external bias is used, the negative of the bias supply connects to terminal No. 1 and the positive to No. 2. If external bias is not desired terminals No. 1 and No. 2 on the Class C amplifier chassis are connected

together. About 30 volts of fixed bias are required to maintain the tubes within their rated plate dissipation without excitation.

Both the grid and the plate currents are metered, the meters being in the cathode return leads. This places both meters at a low DC potential with respect to the chassis, thus eliminating any tendency toward deflection of the needle due to electrostatic effects and removing the possibility of flash-over from the meter terminals to the pilot lamp mounting.

The modulator uses the new 811 tubes and easily delivers the required 125 watts of audio frequency power with very little distortion. It is designed to operate from a "500 ohm" line. The modulation transformer is of the Multi-Match type so that it may be used to modulate any Class C stage of 300 watts input power. The no-signal plate current of the 811's is 60 MA, and the current with a 125 watt sine wave output is 177 MA. For speech signals having the same peak power the plate current should swing to about 90 or 100 MA.

The required driving power is very small, being on the order of 4 peak



TRANSFORMER SPECIALISTS SINCE 1895



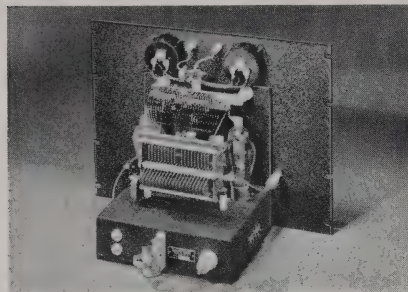
250 Watt Phone Transmitter

450 WATT CW — 160 TO 10 METERS

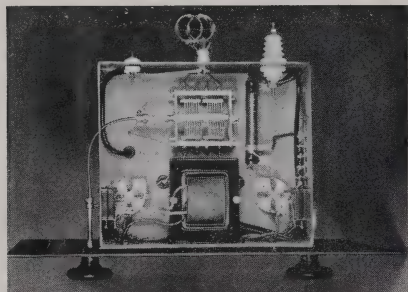
watts. If 2A3's are used as the driver tubes, an unusually high step-down ratio from the plates of the 2A3's to the grids of the 811's may be used to obtain excellent driving regulation. The Thordarson Amateur Speech Amplifier is an excellent unit to furnish the driving power required by this modulator.

The power supply, with its tapped plate transformer, is rated at 300 MA at 1250 or 1500 volts. The load requirements of the Class C amplifier and the modulator are such that the power supply is fully loaded for both phone and CW so that regardless of the type of operation the amateur

chooses, he is not investing in a power supply which is not being loaded up to its rating at all times. The power supply is entirely self-contained with separate plate and filament switches, making it an ideal power supply for other equipment of similar load requirements.

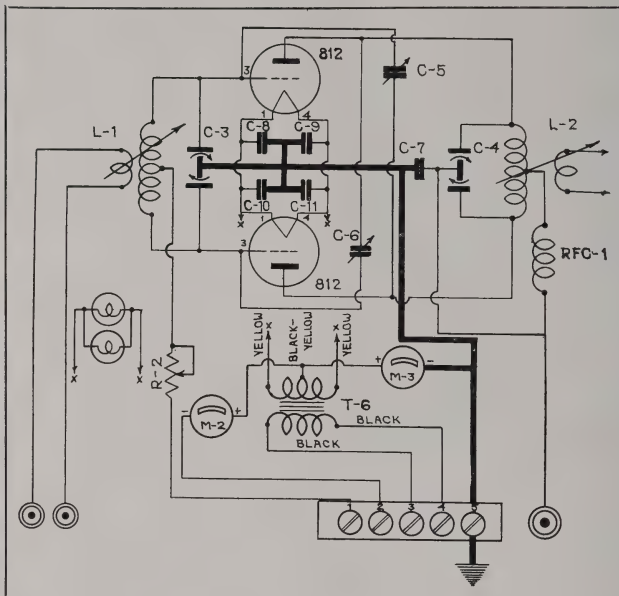


RF Chassis View



RF Bottom View

RF Section



Parts Required

THORDARSON TRANSFORMER

T-6 T-19F85 Filament Transformer

Resistor:

R-2 4,000 Ohm 50 Watt Wirewound
Ohmite Semi-Variable or Equivalent

Condensers:

C-3 Variable Air Condenser, Cardwell
MR-150-BD or Equivalent
C-4 Variable Air Condenser, Cardwell
XP-165-KD or Equivalent
C-5 Neutralizing Condenser, Hammarlund
N-10 or Equivalent
C-6 Neutralizing Condenser, Hammarlund
N-10 or Equivalent
C-7 .001 Mfd. 3,500 Volt Mica Condenser
Aerovox 1653 or Equivalent
C-8 .002 Mfd. 1,000 Volt Mica Condenser
CD-4-6D2 or Aerovox 1455
C-9 .002 Mfd. 1,000 Volt Mica Condenser
CD-4-6D2 or Aerovox 1455
C-10 .002 Mfd. 1,000 Volt Mica Condenser
CD-4-6D2 or Aerovox 1455
C-11 .002 Mfd. 1,000 Volt Mica Condenser
CD-4-6D2 or Aerovox 1455

Tubes:

2 812 Tubes

Miscellaneous Parts:

1 Punched Chassis 8 1/2" x 10" x 3"
1 Panel 19" x 14"
1 Sub-Panel
1 Terminal Board
4 Bushings
3 Feed-thru Insulators
2 4-Contact Isolantite Sockets
2 Stand-off Insulators
1 Shaft Coupling, Johnson No. 252
or Equivalent
2 Panel Bearing Assemblies, Johnson
No. 256 or Equivalent
1 M-2 0-200 MA DC Meter, 3" Square
Case, Rear Illumination, Triplett
No. 327-A or Equivalent
1 M-3 0-300 MA DC Meter, 3" Square
Case, Rear Illumination, Triplett
No. 327-A or Equivalent
2 Control Wheels, Complete, Coto
CI-45 or Equivalent
1 Indicator Plate Marked "PWR
AMP GRID" Coto CI-47 or Equivalent
1 Indicator Plate Marked "PWR
AMP PLATE" Coto CI-47 or Equivalent

Misc. Parts: (Cont'd)

1 Coil Socket, National Type XB-16
or Equivalent
1 L-1 160 Meter Coil, National Type
AR16-160C or Equivalent
1 L-1 80 Meter Coil, National Type
AR16-80S or Equivalent
1 L-1 40 Meter Coil, National Type
AR16-40S or Equivalent
1 L-1 20 Meter Coil, National Type
AR16-20S or Equivalent
1 L-1 10 Meter Coil, National Type
AR16-10S or Equivalent
1 L-2 Swinging Link & Jack Bar Assembly,
B-W Type TV or Equivalent
1 L-2 160 Meter Coil, B-W 160 TVL or
Equivalent
1 L-2 80 Meter Coil, B-W 80 TVL or
Equivalent
1 L-2 40 Meter Coil, B-W 40 TVL or
Equivalent
1 L-2 20 Meter Coil, B-W 20 TVL or
Equivalent
1 L-2 10 Meter Coil, B-W 10 TVL or
Equivalent
2 Grid Grips, National Type 12 or
Equivalent
1 RFC-1 RF Choke, National Type R-154U
or Equivalent
Miscellaneous screws, nuts, bolts, lock-washers,
required hook-up wire and other hardware.

Circuit diagram, drawings and full size template of chassis
available from Thordarson 15 cents net each, postpaid.



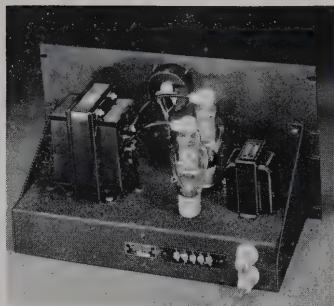
TRANSFORMER SPECIALISTS SINCE 1895



250 Watt Phone Transmitter

450 WATT CW — 160 TO 10 METERS

Modulator and Power Supply



Modulator

Modulator Parts Required

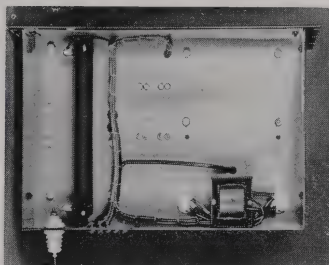
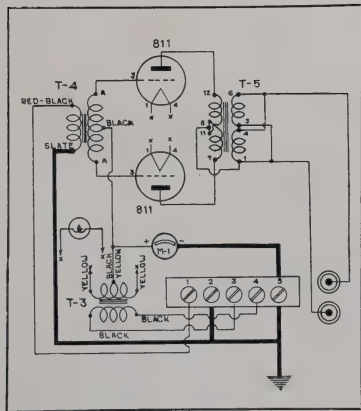
THORDARSON TRANSFORMERS and CHOKES

T-3	T-19F99	Filament Transformer
T-4	T-19D05	Driver Transformer
T-5	T-19M16	Modulation Transformer

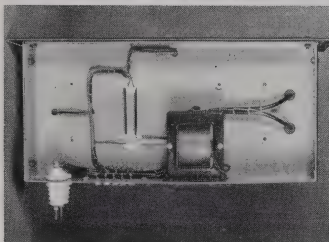
Miscellaneous Parts:

- 2 811 Tubes
- 1 M-1 0-200 MA DC Meter, 3" Square Case, Rear Illumination, Triplett #327A or Equivalent
- 1 Punched Chassis 17" x 8" x 3"
- 1 Panel 19" x 10 1/4"
- 1 Pr. Chassis Mounting Brackets
- 1 5-Lug Terminal Board
- 2 Feed-thru Insulators
- 2 4-Contact Sockets, Steatite
- 2 Isolantite Plate Caps

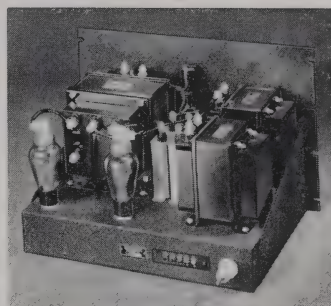
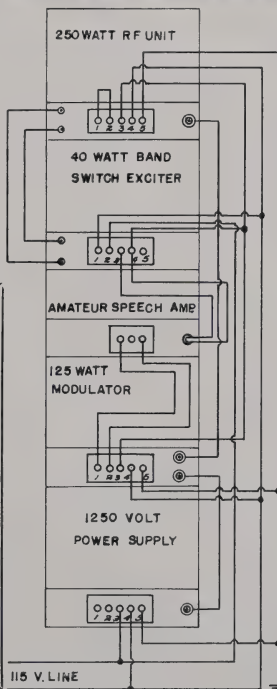
Miscellaneous nuts, bolts, lock-washers, grommets, soldering lugs and other hardware.



Bottom View of Power Supply



Bottom View of Modulator



Power Supply

Power Supply Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-1	T-19F90	Filament Transformer
T-2	T-19P60	Plate Transformer
CH-1	T-19C37	Input Choke
CH-2	T-19C44	Smoothing Choke

Resistor:

- R-1 40,000 Ohm 200 Watt Wirewound Resistor, Ohmite 1370 or Equivalent

Condensers:

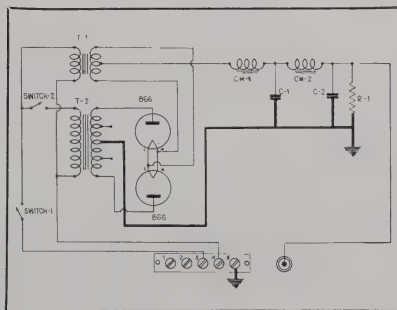
- C-1 2 Mfd. 1,500 Volt Condenser, GE #23F21 or Equivalent
- C-2 2 Mfd. 1,500 Volt Condenser, GE #23F21 or Equivalent

Tubes:

- 2 866 Tubes

Miscellaneous Parts:

- 1 Punched Chassis 17" x 12" x 3"
 - 1 Panel 19" x 12 1/4"
 - 1 Pr. Chassis Mounting Brackets
 - 2 4-Contact Sockets, Steatite
 - 1 Feed-thru Insulator
 - 2 Isolantite Plate Caps
 - 1 SW-1 Switch, Arrow H & H Type HDT or Equivalent
 - 1 SW-2 Switch, Arrow H & H Type HDT or Equivalent
- Miscellaneous nuts, bolts, lock-washers, soldering lugs and other hardware.



Circuit diagram, drawings and full size template of chassis available from Thordarson 15 cents net each, postpaid.



TRANSFORMER SPECIALISTS SINCE 1895



400 Watt Transmitter



Wide Choice of Class C Tubes



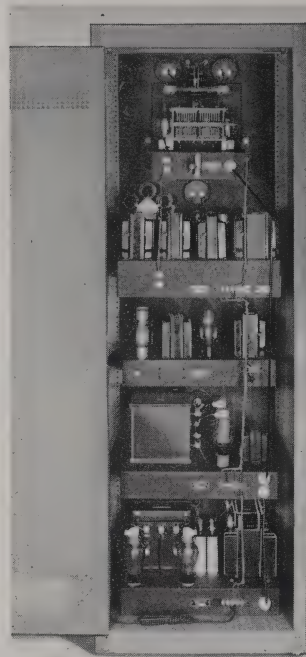
Adjustable Excitation



Adjustable Loading



Multi-Match Modulator



High Efficiency with Adjustable Loading

THIS 400 watt phone transmitter has the same construction and superior features of the transmitter shown on pages 24, 25 and 26. It is suitable for operation on all bands from 160 to 10 meters. It is easily driven by any exciter having an output of 20 watts; an ideal exciter for this transmitter is the Thordarson 40 Watt Band-Switch Exciter.

The transmitter is supplied with panels finished in black wrinkle, and the chassis and chassis mounting brackets are in gray flat enamel.

RF Section:

The unusual mechanical construction of the RF Section results in improved electrical performance. Flexible shafts are used to couple the grid and plate tuning condensers to the panel controls. The tubes used in the RF section are Heintz and Kaufman HK-54's or Taylor T-55's. The HK-54's require a T-19F85 filament transformer, and the T-55's, a T-19F94 filament transformer. Holes are provided on the chassis for either of these types.

A swinging link which couples the plate tank coil to the antenna, permits

the amateur to adjust the loading of the final stage to the desired power input. For 400 watts input, the Class C plate current is 267 MA at 1500 volts. A plate efficiency of between 75% and 80% may be obtained when the transmitter is in proper adjustment.

The grid tank coils are the plug-in type, having link coupling to the exciter. The coils for the 80, 40, 20 and 10 meter bands have semi-fixed swinging links, and the 160 meter coil has a fixed link. Excitation should be adjusted so that the total grid current for both Class C tubes is 40 MA. The value of the grid resistor used with the HK-54's is 3750 ohms; with the T-55's, 5000 ohms.

Since the RF unit was designed primarily for phone operation, no attempt was made to install a fixed bias supply on the RF chassis. However, for CW, provision has been made on the terminal board for the connection of an external bias supply. About 45 volts of bias is required to hold the tubes at their rated dissipation with no excitation. When external bias is not used terminals No. 1 and No. 2 are connected together. If external bias is used, the negative of the bias

supply connects to terminal No. 1 and the positive to No. 2.

Both the grid and the plate currents are metered. The meters are in the cathode return leads, thus placing both meters at a low DC potential with respect to the chassis, and thereby avoiding any possibility of flash-overs from the meter terminals to the pilot lamp mounting and any likelihood of deflection of the movements due to electrostatic effects.

Modulator:

The modulator, using 811's with 1500 volts on the plates, has a power output of 200 watts. The no-signal plate current for two tubes is about 70 MA. With a 200 watt sine-wave output the plate current rises to 217 MA. For speech signals of sufficient magnitude to modulate the Class C stage 100%, the average plate current is about 125 MA. The modulation transformer, as well as the driver transformer, is of the Multi-Match type so that a large variety of Class C loads and sources of driving power may be accommodated. The primary of the driver transformer is designed to couple from a "500 ohm" line. Very little driving power (3.5 watts) is needed to obtain

400 Watt Transmitter

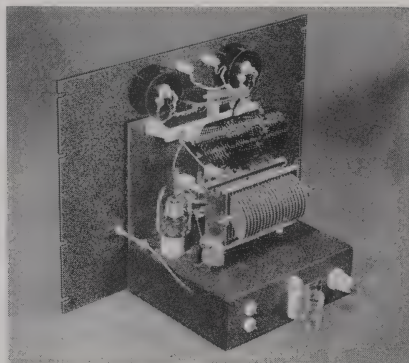
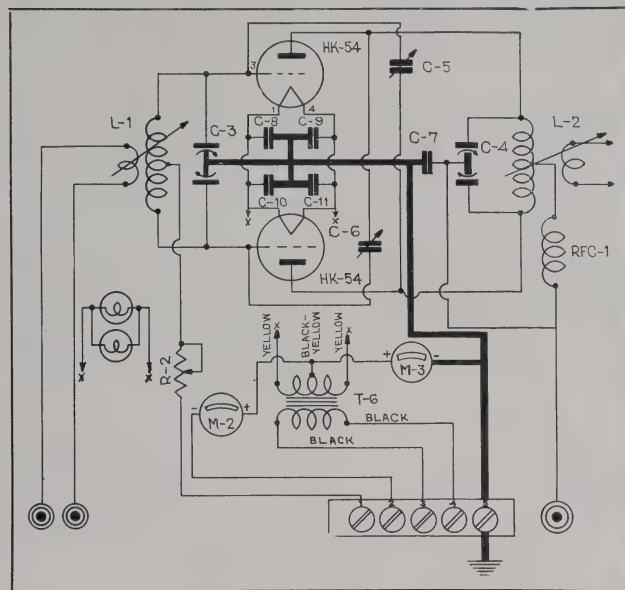
200 watts output; thus the large excess of power output capability of the usually chosen pair of 2A3's serving as driver tubes can be turned to good advantage in obtaining a driving voltage of exceptionally good regulation. The plate-to-plate load on the modulator tubes is 15,500 ohms.

Power Supply:

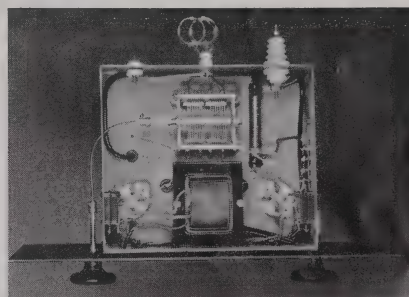
The power supply for this transmitter uses two 866's and has a rating of 500 MA at 1500 volts DC. On its 14" panel are mounted two switches: one for controlling filaments and the other for controlling the plate transformer. Having well insulated line terminals

and high voltage terminals mounted on the rear apron of the chassis, the power supply matches in appearance and construction the modulator and RF units with which it was designed to operate. Its simplicity and completeness make it an excellent general purpose power supply.

RF Section



RF Chassis View



RF Bottom View

RF Section Parts Required

THORDARSON TRANSFORMER		
T-6	T-19F99	Filament Transformer
Resistor:		
R-2	4,000 Ohm 50 Watt Wirewound	Ohmite Semi-Variable or Equivalent
Condensers:		
C-3	150-150 Mmfd.	Variable Condenser, Cardwell MR-150-BD or Equivalent
C-4	165-165 Mmfd.	Variable Condenser, Cardwell XP-165-KD or Equivalent
C-5	Neutralizing Condenser,	Hammarlund N-10 or Equivalent
C-6	Neutralizing Condenser,	Hammarlund N-10 or Equivalent
C-7	.001 Mfd. 3,500 Volt Mica	Condenser Aerovox 1653 or Equivalent
C-8	.002 Mfd. 1,000 Volt Mica	Condenser CD4-6D2 or Aerovox 1455
C-9	.002 Mfd. 1,000 Volt Mica	Condenser CD4-6D2 or Aerovox 1455
C-10	.002 Mfd. 1,000 Volt Mica	Condenser CD4-6D2 or Aerovox 1455
C-11	.002 Mfd. 1,000 Volt Mica	Condenser CD4-6D2 or Aerovox 1455
Tubes:		
2	HK-54 Tubes	

Miscellaneous Parts:	
1	Punched Chassis 8 1/2" x 10" x 3"
1	Panel 19" x 14"
1	Sub-Panel
1	Terminal Board
4	Bushings
3	Feed-thru Insulators
2	4-Contact Isolantite Sockets
2	Stand-off Insulators
2	Shaft Couplings, National TX-11 or Equivalent
1	Shaft Coupling, Johnson #252 or Equiv.
2	Panel Bearing Assemblies, Johnson #256 or Equivalent
1	M-2 0-200 MA DC Meter, 3" Square Case, Rear Illumination, Triplett #327-A or Equivalent
1	M-3 0-300 MA DC Meter, 3" Square Case, Rear Illumination, Triplett #327-A or Equivalent
2	Control Wheels, Complete, Coto CI-45 or Equivalent
1	Indicator Plate Marked "PWR AMP GRID" Coto CI-47 or Equivalent
1	Indicator Plate Marked "PWR AMP PLATE" Coto CI-47 or Equivalent

Misc. Parts: (Cont'd)	
1	Coil Socket, National Type XB-16 or Equivalent
1	L-1 160 Meter Coil, National Type AR16-160C or Equivalent
1	L-1 80 Meter Coil, National Type AR16-80S or Equivalent
1	L-1 40 Meter Coil, National Type AR16-40S or Equivalent
1	L-1 20 Meter Coil, National Type AR16-20S or Equivalent
1	L-1 10 Meter Coil, National Type AR16-10S or Equivalent
1	L-2 Swinging Link & Jack Bar Assembly, B-W Type TV or Equivalent
1	L-2 160 Meter Coil, B-W 160 TVL or Equiv.
1	L-2 80 Meter Coil, B-W 80 TVL or Equiv.
1	L-2 40 Meter Coil, B-W 40 TVL or Equiv.
1	L-2 20 Meter Coil, B-W 20 TVL or Equiv.
1	L-2 10 Meter Coil, B-W 10 TVL or Equiv.
2	Grid Grips, National Type 12 or Equiv.
1	RFC-1 RF Choke, National Type R-154U or Equivalent
Miscellaneous screws, nuts, bolts, lock-washers, required hook-up wire and other hardware.	

Circuit diagram, drawings and full size template of chassis available from Thordarson 15 cents net each, postpaid.

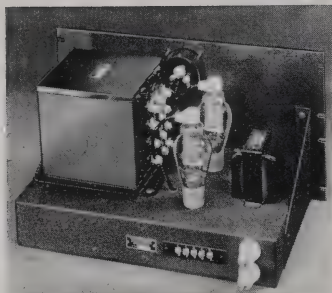


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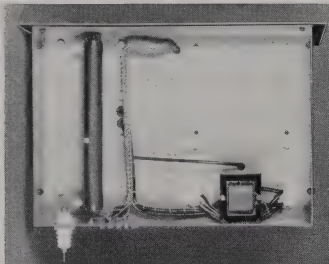


400 Watt Transmitter

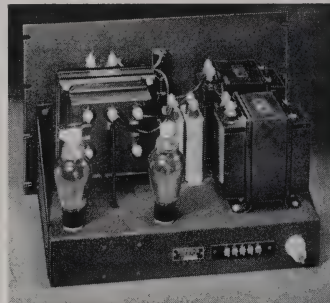
Modulator and Power Supply



Modulator



Bottom View of Power Supply



Power Supply

Modulator Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-3	T-19F99	Filament Transformer
T-4	T-19D05	Driver Transformer
T-5	T-19M17	Modulation Transformer

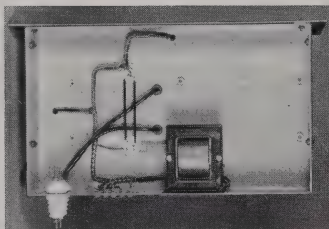
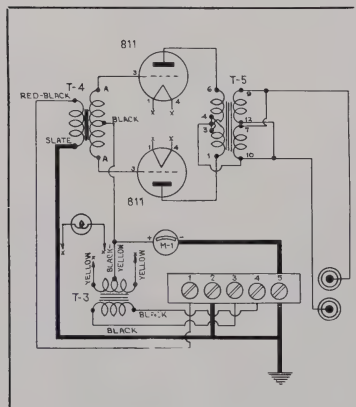
Tubes:

2 811 Tubes

Miscellaneous Parts:

- 1 M-1 0-300 MA DC Meter, 3" Square Case Triplett 327-A or Equivalent
- 1 Punched Chassis 17" x 10" x 3"
- 1 Panel 19" x 10 1/2"
- 1 Pr. Chassis Mounting Brackets
- 2 Feed-thru Insulators
- 2 4-Contact Sockets, Steatite
- 2 Isolantite Plate Caps

Miscellaneous nuts, bolts, lock-washers, grommets and other hardware.



Bottom View of Modulator

Power Supply Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-1	T-19F90	Filament Transformer
T-2	T-19P64	Plate Transformer
CH-1	T-19C37	Input Choke
CH-2	T-19C44	Smoothing Choke

Resistor:

- R-1 40,000 Ohm 200 Watt Wirewound Resistor, Ohmite 1370 or Equivalent

Condensers:

- C-1 2 Mfd. 2,000 Volt Condenser GE #23F31 or Equivalent
- C-2 2 Mfd. 2,000 Volt Condenser GE #23F31 or Equivalent

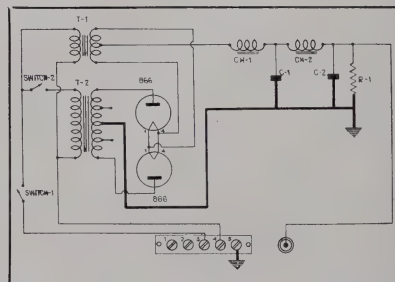
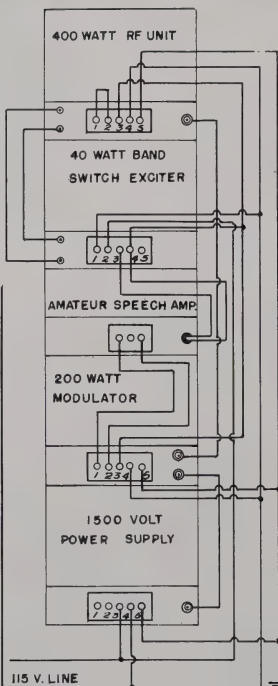
Tubes:

2 866 Tubes

Miscellaneous Parts:

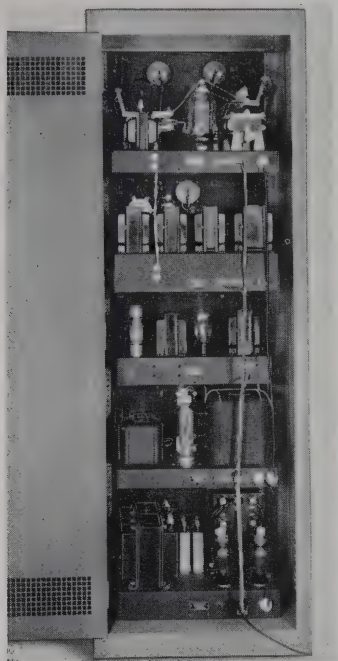
- 1 SW-1 Switch, Arrow H & H Type HDT or Equivalent
- 1 SW-2 Switch, Arrow H & H Type HDT or Equivalent
- 1 Punched Chassis 17" x 12" x 3"
- 1 Panel 19" x 14 1/2"
- 1 Pr. Chassis Mounting Brackets
- 2 Terminal Board
- 2 4-Contact Sockets, Steatite
- 2 Feed-thru Insulator
- 2 Isolantite Plate Caps

Miscellaneous nuts, bolts, lock-washers and other hardware.



Circuit diagram, drawings and full size template of chassis available from Thordarson 15 cents net each, postpaid.

600 Watt Transmitter



Completely Relay Controlled



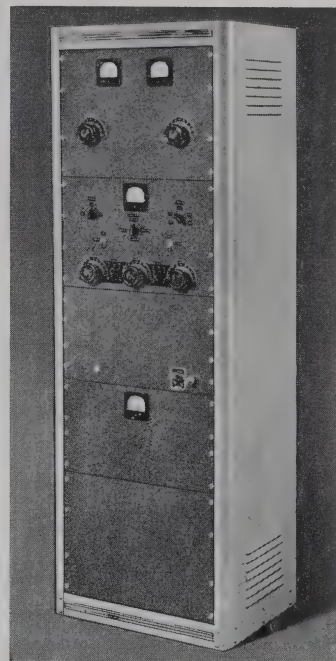
Under Excitation Protection



High Quality Audio System



Multi-Match Modulator



THIS transmitter consists of a Class C amplifier of 600 watts input, a modulator capable of delivering 300 watts of audio frequency power and a 1750 volt power supply of sufficient capacity to furnish the current required by both the RF stage and the modulator. Operation may be obtained on all five amateur bands from 160 to 10 meters. Relay switching is incorporated in this transmitter, thus not only permitting complete control of the transmitter with a single switch but also protecting the Class C amplifier from under-excitation and preventing the possibility of abuse to the modulation transformer by underloading it.

The Class C amplifier may be operated with any one of three types of tubes, namely Taylor TW-150's, Eimac 100TH's or Heintz and Kaufman HK-254's. The modulator tubes are Taylor 805's, and the rectifier tubes are 866's.

The panels are supplied in a black wrinkle finish; and the chassis, chassis mounting brackets and other small metal fixtures in a gray flat enamel.

RF Unit:

The Class C amplifier circuit is of the conventional push-pull type operating with 600 watts input at 1750 volts. It requires from 30 to 40 watts of driving power. The Thordarson 120 watt Band-Switch Exciter or the Thordarson 100 Watt Multi-Band Transmitter are ideal exciters. These units are described on pages 18 and 20. Plate and grid coils are of the plug-in type with a swinging link and jack bar assembly, thus permitting close adjustment of grid excitation and plate loading. Provision is made on the chassis for using either the UX sockets required by the TW-150's and the 100TH's, or the 50 watt sockets needed for use with HK-254's. The grid resistor is of the semi-variable type so that the correct bias requirements for various tubes may be met. The plate tuning condenser is of the split-stator type, having each stator section divided into two parts. This permits a very favorable L/C ratio to be obtained on all bands. The coils specified for the plate tank circuit have such a base construction that the correct stator combination is automatically obtained on each band when the coil is plugged in.

With 600 watts input the Class C plate current is 343 MA at 1750 volts. Plate efficiencies on the order of 75% are easily obtainable. When the amplifier is unloaded the plate current at resonance dips to about 25 MA on the 160, 80 and 40 meter bands; and to about 40 and 50 MA when operation is on the 20 and 10 meter bands respectively. The grid current is about 100 MA (for two tubes), and the grid resistor should be adjusted to about 1200 ohms.

Modulator:

The modulator has a "500 ohm" input and can be easily driven by the Thordarson Amateur Speech Amplifier. A rectified AC bias supply is installed on the modulator chassis. It uses a type 83 tube, which furnishes 20 volts of bias. This bias not only prevents the plate dissipation of the 805's from rising to an abnormal value during periods of no-signal but also tends to reduce distortion in the output of the modulator.

With no-signal on the grids of the 805's the plate current (two tubes) is about 80 MA. This current rises to 345 MA with a sine wave signal of magnitude sufficient to cause 100%



TRANSFORMER SPECIALISTS SINCE 1895

THORDARSON

600 Watt Transmitter

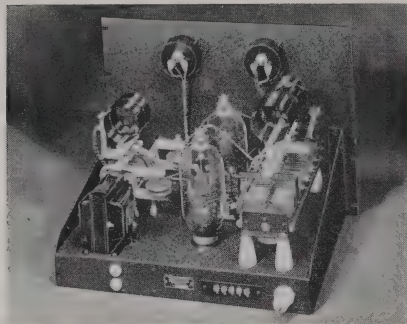
modulation, but for speech the same degree of modulation can be obtained when the modulator current rises to about 150 MA.

When the "500 ohm" input to the modulator grids is supplied by a

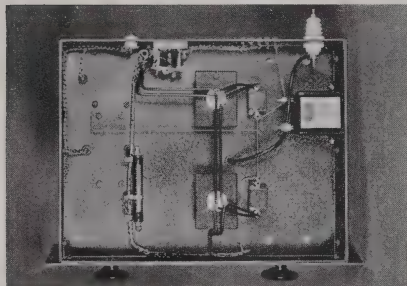
Thordarson Amateur Speech Amplifier, the driver transformer ratio should be 1 to 1.4, primary to half the secondary. The turns ratio of the modulation transformer is 1.4 to 1, and the plate-to-plate load on the modulators is 10,000 ohms.

The driver and modulation transformers are of the Multi-Match type so that not only may a variety of Class C loads be accommodated but also different driving tubes may be used.

(Continued on Page 31)

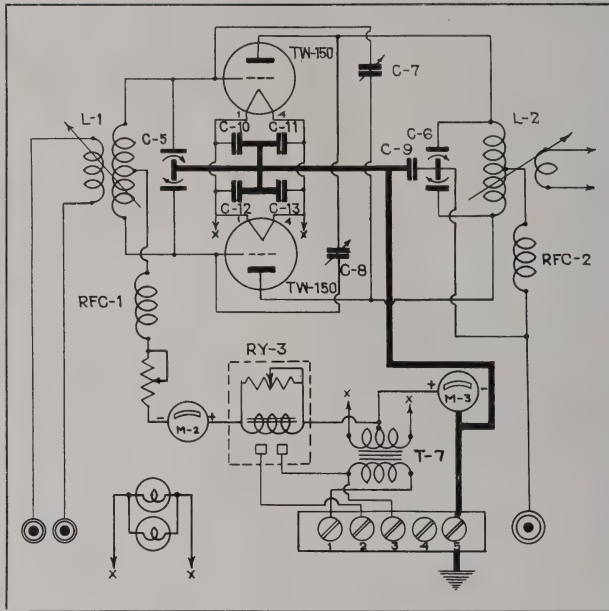


RF Chassis View



RF Bottom View

RF Section



RF Section Parts Required

THORDARSON TRANSFORMER

T-7 T-74F23 Filament Transformer

Resistor:

R-3 2,500 Ohm 50 Watt Semi-Variable Resistor, Ohmite or Equivalent

Condensers:

C-5 260-260 Mmfd. Variable Condenser, Cardwell MR-260-BD or Equivalent
C-6 160-160 Mmfd. Variable Condenser, Cardwell XE-160-70-XQ or Equivalent
C-7 Neutralizing Condenser, Hammarlund N-10 or Equivalent
C-8 Neutralizing Condenser, Hammarlund N-10 or Equivalent
C-9 .001 Mfd. Mica Condenser, CD-21C-86 or Equivalent
C-10 .002 Mfd. Mica Condenser, CD-4-6D2 or Aerovox 1455
C-11 .002 Mfd. Mica Condenser, CD-4-6D2 or Aerovox 1455
C-12 .002 Mfd. Mica Condenser, CD-4-6D2 or Aerovox 1455
C-13 .002 Mfd. Mica Condenser, CD-4-6D2 or Aerovox 1455

Tubes:

2 TW-150 or HK-254 or 100TH

Miscellaneous Parts:

1 Punched Chassis 17" x 13" x 2 1/4"
1 Panel 19" x 14"
1 Chassis Mounting Brackets
1 Socket Mounting Plates
1 Condenser Mounting Brackets
1 Coil Mounting Brackets
1 Bushings
1 Feed-thru Bushing
1 Feed-thru Insulators
1 4-Contact Sockets, Seatite
1 50 Watt Sockets
1 Grid Grips
1 Cone Insulators
1 SPST Underload Relay, Ward-Leonard 507-514A or Equivalent
1 0-200 MA DC Meter, 3" Square Case, Rear Illumination, Triplett #327A or Equivalent
1 0-500 MA DC Meter, 3" Square Case Rear Illumination, Triplett #327A or Equivalent
1 Swinging Link & Jack Bar Assembly, B-W Type BVL or Equivalent
1 160 Meter Coil, B-W Type 160 BVL or Equivalent
1 80 Meter Coil, B-W Type 80 BVL or Equivalent
1 40 Meter Coil, B-W Type 40 BVL or Equivalent

Miscellaneous Parts: (Cont.)

1 L-1 20 Meter Coil, B-W Type 20 BVL or Equivalent
1 L-1 10 Meter Coil, B-W Type 10 BVL or Equivalent
1 L-2 160 Meter Coil, B-W Type 160 TVH or Equivalent
1 L-2 80 Meter Coil, B-W Type 80 TVH or Equivalent
1 L-2 40 Meter Coil, B-W Type 40 TVH or Equivalent
1 L-2 20 Meter Coil, B-W Type 20 TVH or Equivalent
1 L-2 10 Meter Coil, B-W Type 10 TVH or Equivalent
1 L-2 Swinging Link & Jack Bar Assembly, B-W Type TVH or Equivalent
1 RFC-1 RF Choke, National Type R-100-U or Equivalent
1 RFC-2 RF Choke, National Type R-154 or Equivalent
2 4' Shaft Extensions, Yaxley RS-242 or Equivalent
2 2 1/2" Control Wheels, Coto CI-45 or Equivalent
1 Indicator Plate Marked "PWR AMP GRID," Coto CI-47 or Equivalent
1 Indicator Plate Marked "PWR AMP PLATE," Coto CI-47 or Equivalent
Miscellaneous screws, nuts, bolts, lock-washers, required hook-up wire and other hardware.

Circuit diagram, drawings and full size template of chassis available from Thordarson 15 cents net each, postpaid.

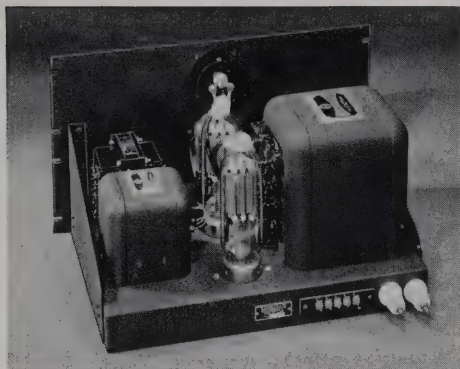


TRANSFORMER SPECIALISTS SINCE 1895

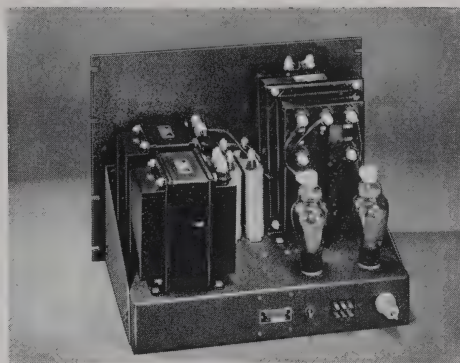


600 Watt Transmitter

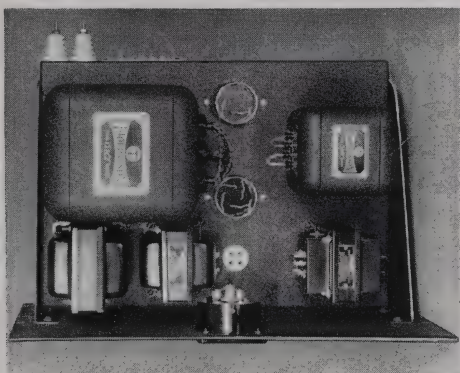
Modulator and Power Supply



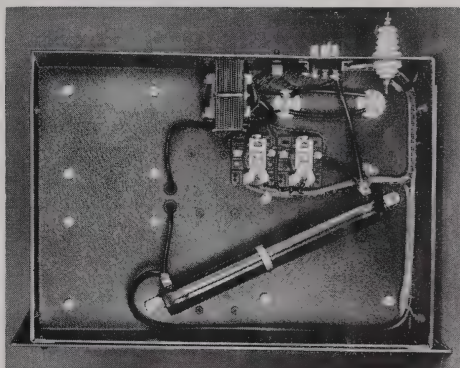
Modulator



Power Supply



Top View of Modulator



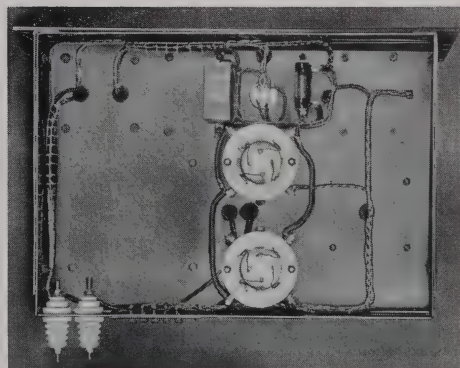
Bottom View of Power Supply

Power Supply:

FOR BOTH the convenience of the operator and the protection of the equipment, relay switching was chosen. When the filament switch on the exciter is closed, RY-1 closes, causing the application of voltage to the speech amplifier and the filaments of the rectifiers, modulator tubes and Class C amplifier tube. In addition, this operation places bias voltage on the modulator grids and prepares RY-2 for closing. Turning on the plate switch of the exciter results in the grid current in the Class C amplifier closing RY-3, which in turn causes RY-2 to apply primary voltage to the plate transformer. The opening of SW-1 prevents the operation of RY-2 even though RY-3 may be closed. This feature makes neutralizing convenient, and in addition affords more protection to the operator.

For CW operation it is only necessary to place a jumper between terminals 2 and 3 at the back of the RF chassis and insert a 22.5 volt battery at point A.

Since the power supply is rated at 1750 volts at 500 MA, 700 watts CW operation may be carried on by operating with a Class C plate current of 400 MA.



Bottom View of Modulator

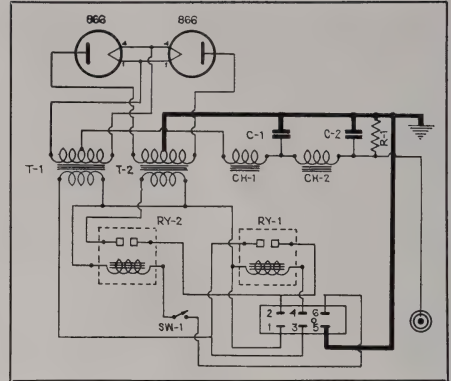
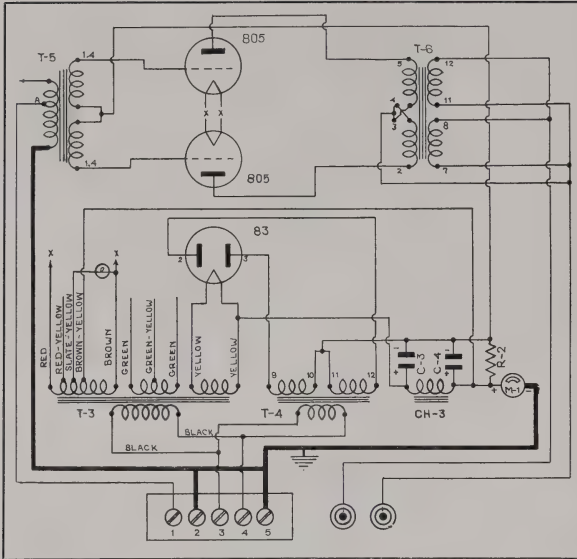


TRANSFORMER SPECIALISTS SINCE 1895



600 Watt Transmitter

Modulator and Power Supply



Power Supply Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-1	T-19F90	Filament Transformer
T-2	T-19P66	Plate Transformer
CH-1	T-19C38	Choke
CH-2	T-19C45	Choke

Resistor:

R-1	75,000 Ohm 200 Watt Wirewound Resistor, Ohmite No. 0924 or Equivalent
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Condensers:

C-1	2 Mfd. 2000 Volt Condenser, Mallory TX-811 or Equivalent
C-2	2 Mfd. 2000 Volt Condenser, Mallory TX-811 or Equivalent

Tubes:

2	866	Tubes
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Miscellaneous Parts:

1	RY-1	Relay, SPST, Ward-Leonard No. 507-510 or Equivalent
1	RY-2	Relay, SPST, Ward-Leonard No. 507-518 or Equivalent
1	SW-1	SPST Switch N.P., Arrow H and H No. 20992 or Equivalent
1		Punched Chassis 17" x 13" x 2 1/2"
1		Panel 19" x 14"
1 Pr.		Chassis Mounting Brackets
1		Switch Plate
2		4-Contact Sockets, Steatite
2		Isolantite Plate Caps
1		Lead-in Bushing
1		6-Contact Socket
1		6-Prong Plug

Miscellaneous screws, nuts, bolts, lock-washers, required hook-up wire and other hardware

Modulator Parts Required

THORDARSON TRANSFORMERS and CHOKES

T-3	T-19F77	Filament Transformer
T-4	T-19R31	Bias Transformer
T-5	T-15D82	Driver Transformer
T-6	T-11M77	Modulation Transformer
CH-3	T-19C42	Filter Choke

Resistor:

R-2	100 Ohm 25 Watt Semi-Variable Resistor Ohmite #0368 or Equivalent
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Condensers:

C-3	Double 16 Mfd. 250 Volt Condenser, Aerovox Type PBS or Equivalent
C-4	

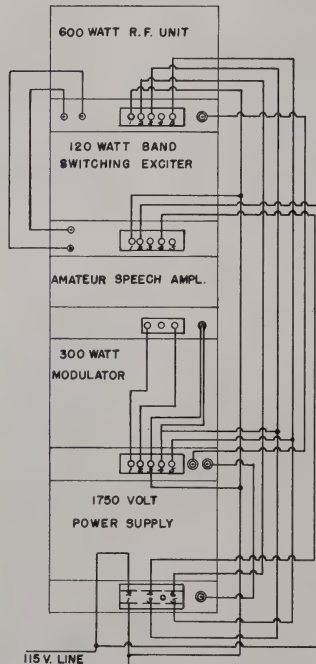
Tubes:

1	83	Tube
2	805	Tubes, Taylor or Equivalent

Miscellaneous Parts:

1		0-500 MA DC Meter, 9" Square Case, Rear Illumination, Triplett #327-A or Equivalent
1		Punched Chassis 17" x 12" x 2 1/2"
1		Panel 19" x 10 1/2"
1 Pr.		Chassis Mounting Brackets
4		Bushings
1		Terminal Board
2		50 Watt Sockets
1		4-Contact Socket, Steatite
1		Lead-in Bushings
2		Grid Grips

Miscellaneous screws, nuts, bolts, lock-washers, required hook-up wire and other hardware.

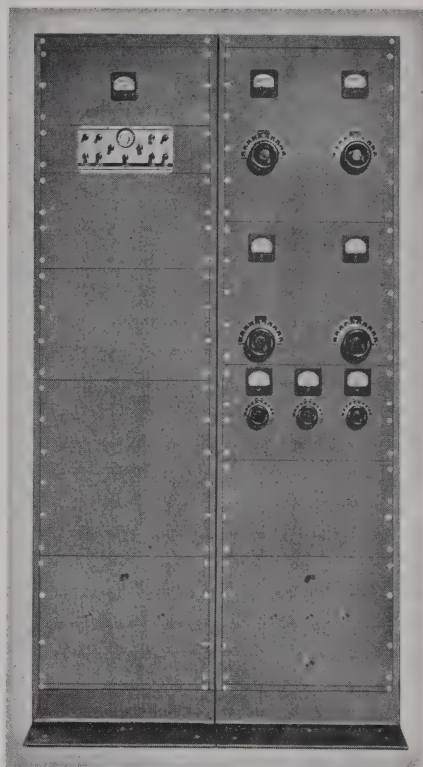
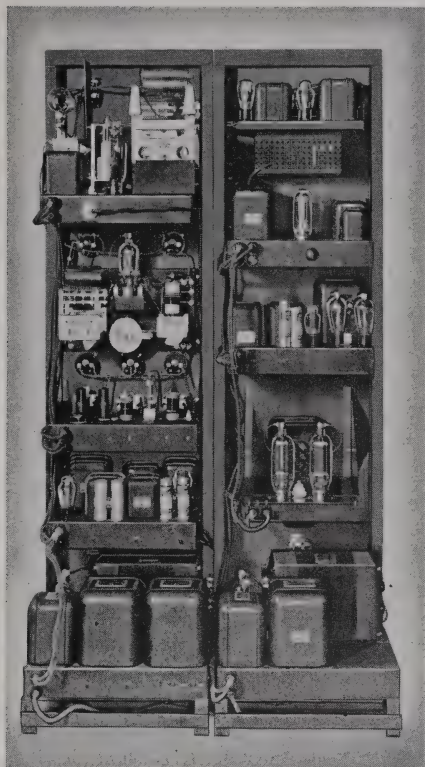


Circuit diagram, drawings and full size template of chassis available from Thordarson 15 cents net each, postpaid.



TRANSFORMER SPECIALISTS SINCE 1895





HERE is a conservatively rated transmitter which is designed to handle the maximum allowable input of 1 kilowatt. The transmitter is built up in two racks, one containing the R.F. section with associated power supplies and the other the speech equipment, drivers, modulators, and necessary power equipment.

The exciter unit is built up on a separate chassis. Three stages are provided so that there is ample excitation on all bands. It may be found necessary to neutralize the 6L6 and the RK-39, especially if they are operated as straight buffers on the higher frequencies. These neutralizing condensers (NC-1, NC-2) may consist simply of a few turns of twisted wire. The RK-39 is link coupled to the T125 buffer; this stage should always be operated as a straight amplifier and all doubling should be done in the preceding low power stages. The buffer in turn is link coupled to the final stage, which consists of a pair of T-200's in push-pull. The plate voltage is 2500 volts and the plate current 400 M.A.; the grid current should be 125 M.A.

No pre-amplifier is incorporated in

the transmitter proper. It is far more desirable, both from the standpoint of convenience and performance, to place the low level speech stages some distance from the transmitter. The impedance of the speech input is 500 ohms and the level approximately zero db. The first stage consists of a pair of 6F6's, triode connected, which provide ample grid swing for the 845's. The 845 drivers operate at 1250 volts, and the necessary bias is obtained from a resistor in the filament return. The 822 modulators operate at 2000 volts and provide ample power to modulate the 1 kilowatt input.

An important feature of high power equipment which has not been overlooked is the installation of an underload and two overload relays.

The underload relay is so connected that the Class C current must be 250 M.A. before the modulator plate supply is turned on. Possible damage to the modulation transformer is avoided in the event that excitation to the final fails with a signal applied to the modulators. If the current of either the Class C stage or the buffer should be-

come excessive, the overload relay will automatically turn off all plate supplies. Another overload relay is installed in the modulator plate supply, however this relay controls only the modulators. In order to simplify operation, relays are also used to control the filaments and plate supplies. The wiring is so arranged that it is impossible to turn on the plate supplies without having the filament relay closed. This relay operation of both filament and plate supplies enables the transmitter to be controlled from the operating table simply by extending the light leads connected to the relay switches.

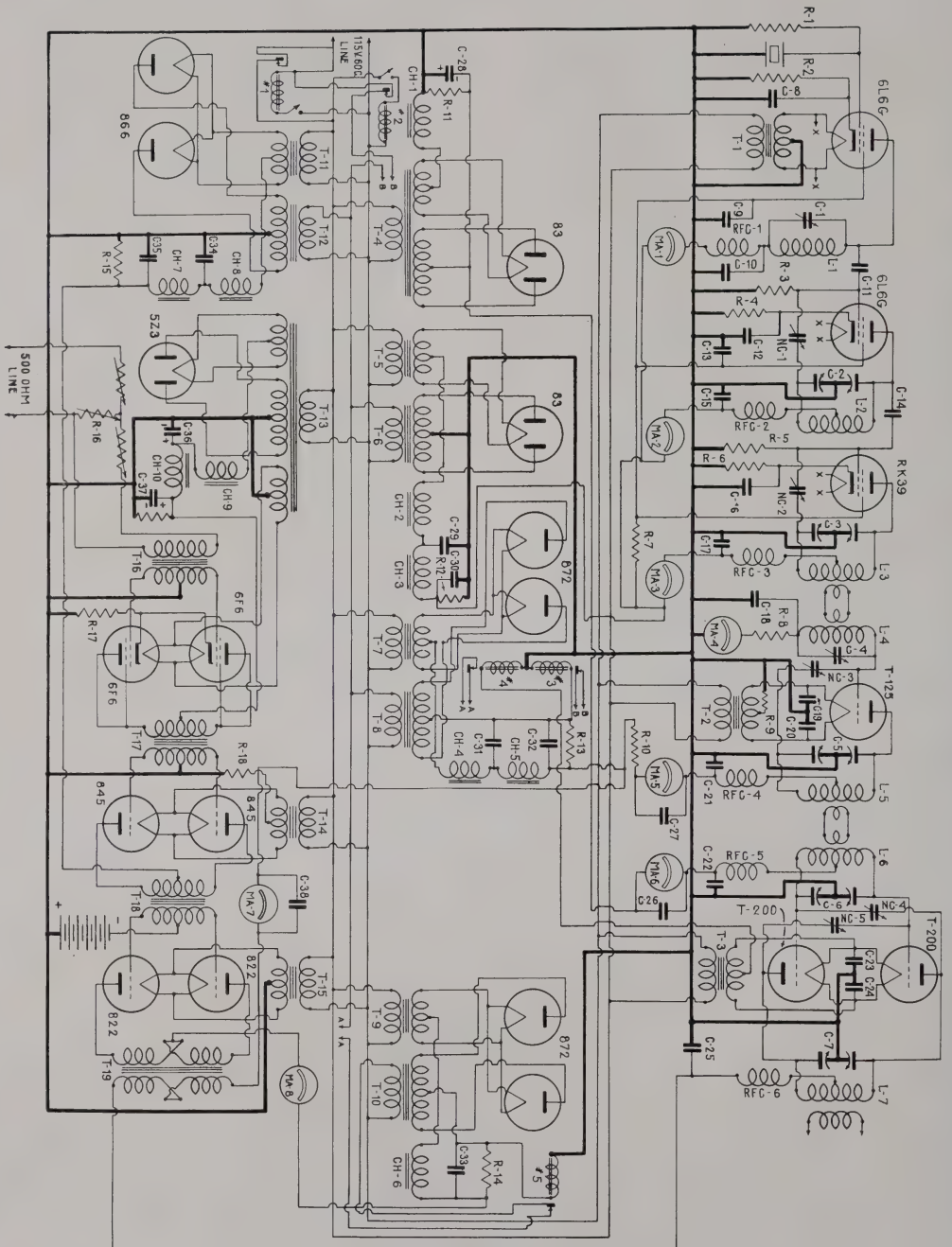
The correct bias for the 822 modulators is -67.5, and this is shown as battery bias in the diagram, although in the photograph an experimental bias supply is shown. This bias supply has not yet been fully developed and it is felt that it should be with-held until its performance is proven satisfactory.

The pre-amplifier is shown on page 37. It is mounted in a metal cabinet and if remote control is desired the filament and plate relay switches may be mounted on this panel.



1000 Watt Transmitter

(CONTINUED)



1000 Watt Transmitter

(CONTINUED)

Parts Required

Thordarson Transformers and Chokes

T-1	T-19F97	CH-1	T-15C36
T-2	T-19F96	CH-2	T-15C36
T-3	T-11F51	CH-3	T-15C45
T-4	T-15R60	CH-4	T-15C39
T-5	T-19F91	CH-5	T-15C48
T-6	T-15P11	CH-6	T-15C39
T-7	T-11F54	CH-7	T-15C45
T-8	T-15P21	CH-8	T-15C36
T-9	T-11F54	CH-9	T-15C36
T-10	T-15P21	CH-10	T-15C45
T-11	T-19F89		
T-12	T-15P15		
T-13	T-15R03		
T-14	T-19F96		
T-15	T-11F51		
T-16	T-15A67		
T-17	T-15D76		
T-18	T-18D19		
T-19	T-11M78		

Resistors:

R-1	50,000 Ohm 1 Watt IRC BT1 or Equiv.
R-2	200 Ohm 10 Watt Ohmite or Equiv.
R-3	10,000 Ohm 10 Watt Ohmite or Equiv.
R-4	200 Ohm 10 Watt Ohmite or Equiv.
R-5	10,000 Ohm 10 Watt Ohmite or Equiv.
R-6	50 Ohm 10 Watt Ohmite or Equiv.
R-7	5,000 Ohm 25 Watt Ohmite or Equiv.
R-8	2,000 Ohm 25 Watt Ohmite or Equiv.
R-9	2,000 Ohm 50 Watt Ohmite or Equiv.
R-10	10,000 Ohm 50 Watt Ohmite or Equiv.
R-11	1,000 Ohm 75 Watt Ohmite or Equiv.
R-12	25,000 Ohm 50 Watt Ohmite or Equiv.
R-13	
R-14	100,000 Ohm 200 Watt Ohmite or Equiv.
R-15	50,000 Ohm 100 Watt Ohmite or Equiv.
R-16	500 Ohm 25 Watt T Pad Utah or Equiv.
R-17	750 Ohm 10 Watt Ohmite or Equiv.
R-18	2,000 Ohm 50 Watt Ohmite or Equiv.

CONDENSERS

Variable Condensers

C-1	150 Mmf. Cardwell MR150BS or Equiv.
C-2	
C-3	260 Mmf. Cardwell MR260BD or Equiv.
C-4	150 Mmf. National TMC150 or Equiv.
C-5	100 Mmf. National TMA100DA or Equiv.
C-6	200 Mmf. National TMC200D or Equiv.
C-7	200 Mmf. National TMC200DA or Equiv.

Fixed Condensers:

C-8 to C-10	.001 Mfd. 1000 Volt Mica Aerovox 1450 or Equiv.
C-11	.0001 Mfd. 1000 Volt Mica Aerovox 1450 or Equiv.
C-12, C-13	.001 Mfd. 1000 Volt Mica Aerovox 1450 or Equiv.
C-14	.0001 Mfd. 1000 Volt Mica Aerovox 1450 or Equiv.
C-15 to C-20	.001 Mfd. 1000 Volt Mica Aerovox 1450 or Equiv.
C-21	.001 Mfd. 5000 Volt Mica Aerovox 1652 or Equiv.
C-22 to C-24	.001 Mfd. 1000 Volt Mica Aerovox 1450 or Equiv.
C-25	.001 Mfd. 10,000 Volt Mica Aerovox 1654 or Equiv.
C-26, C-27	.001 Mfd. 1000 Volt Mica Aerovox 1450 or Equiv.
C-28	16 Mfd. 450 Volt Elec. Aerovox G475 or Equiv.
C-29, C-30	2 Mfd. 1000 Volt Aerovox 1010 or Equiv.
C-31 to C-33	2 Mfd. 3000 Volt Aerovox 3009 or Equiv.
C-34, C-35	2 Mfd. 2000 Volt Aerovox 2009 or Equiv.
C-36, C-37	8 Mfd. 450 Volt Elec. Aerovox G475 or Equiv.
C-38	.001 Mfd. 1000 Volt Mica Aerovox 1450 or Equiv.

Neutralizing Condensers:

NC-1	See note in copy
NC-2	See note in copy
NC-3	12 Mmf. 8000 Volt National NC-150 or Equiv.
NC-4	13 Mmf. 12,000 Volt Johnson N875 or Equiv.
NC-5	

Meters:

MA-1	0-100 M.A. Simpson 27S (Illum.) or Equiv.
MA-2	0-150 M.A. Simpson 27S (Illum.) or Equiv.
MA-3	
MA-4	0-100 M.A. Simpson 27S (Illum.) or Equiv.
MA-5	0-500 M.A. Simpson 27S (Illum.) or Equiv.
MA-6	0-250 M.A. Simpson 27S (Illum.) or Equiv.
MA-7	0-750 M.A. Simpson 27S (Illum.) or Equiv.
MA-8	

RF Chokes:

RFC-1 to RFC-3	125 M.A. National R100 or Equiv.
RFC-4	600 M.A. National R154U or Equiv.
RFC-5	125 M.A. National R100 or Equiv.
RFC-6	600 M.A. National R154U or Equiv.

Relays:

#1, #2	Guardian R100 or Equiv.
#3	Guardian L500 or Equiv.
#4	Guardian (special) or Equiv.
#5	Guardian L500 or Equiv.

Miscellaneous Parts:

5 Pr.	Chassis Mounting Brackets
4	3 1/4" Wheels Coto or Equiv.
3	2 1/4" Wheels Coto or Equiv.
3	Coil Forms National XR-4 or Equiv.
1	Coil Assembly National UR-13 or Equiv.
2	Coils Coto-Coil 80 BTVL or Equiv.
1	Coil Coto-Coil 80 TVL or Equiv.
11	Sockets Johnson type 211 or Equiv.
2	C-1 Bases Coto-Coil 6BTLM or Equiv.
1	C-1 Base Coto-Coil 8TLM or Equiv.
2	Cone Insulators Johnson #604 or Equiv.
4	Bee Hive Insulators Johnson #45 or Equiv.
8	Feed-thru Insulators Johnson #42 or Equiv.
4	1" Cone Insulators Johnson #601 or Equiv.
2	Insulators National #GS-1 or Equiv.
3	Insulators National #GS-1 or Equiv.
6	SPST Toggle Switches H & H or Equiv.
4	Stearite Sockets Amphenol or Equiv.
2	Stearite Octal Sockets Amphenol or Equiv.
23	Bakelite Sockets Amphenol or Equiv.
2	Bakelite Octal Sockets Amphenol or Equiv.
18	Plugs Amphenol or Equiv.
1	Bakelite Knob
14	Large Grid Grips

Tubes:

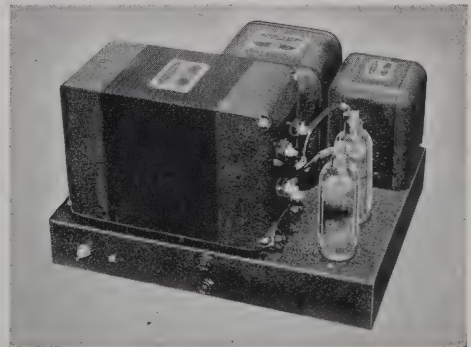
1	RK39	1	T-125
2	T-200	4	872
2	866	2	83
1	5Z3	2	6F6
2	845	2	822
26L6-G or 6L6GX			

See page 37 for Pre-Amplifier

COIL DATA

BAND	160	80	40	20	10
L1, L2, L3, L4	40T #18	26T #16	12T #16	8T #16	3T #16
L5, L6	36T #16 4 1/8" Diam.	34T #16 2 7/8" Diam.	22T #16 2 7/8" Diam.	16T #14 2 3/8" Diam.	4T #14 2 7/8" Diam.
L7	42T #14 5 1/8" Diam.	30T #10 4 3/8" Diam.	20T #10 3 1/4" Diam.	10T #10 3 1/4" Diam.	4T #10 3 1/4" Diam.
Link for L3, L4, L5, L6	4T #18C.C.	3T #18C.C.	2T #18C.C.	2T #18C.C.	2T #18C.C.

L1, L2, L3 wound on 1 1/2" Diam. winding length 1 3/4". L4 wound on 1 3/4" Diam. winding length 2". Winding length of L5, L6, 4 1/2". Winding length of L7, 6 1/2".



MODULATOR POWER SUPPLY
Chassis: 20" x 15" x 3 1/4"; Panel: 14"

Circuit diagram, drawings and full size template of chassis available from Thordarson 15 cents net each, postpaid.

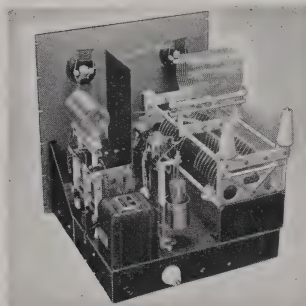


TRANSFORMER SPECIALISTS SINCE 1895



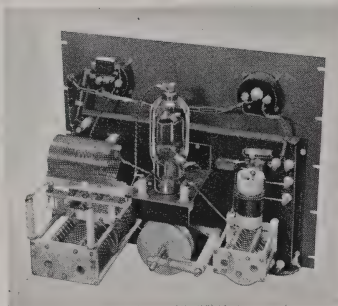
1000 Watt Transmitter

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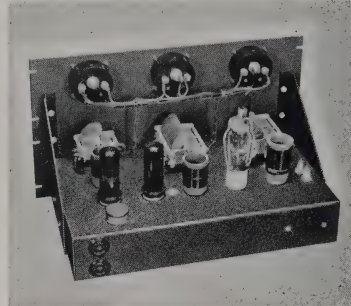
R. F. POWER AMPLIFIER

Chassis: 17" x 17" x 3"; Panel: 19 1/4"



BUFFER

Chassis: 17" x 10" x 1"; Panel: 15 3/4"



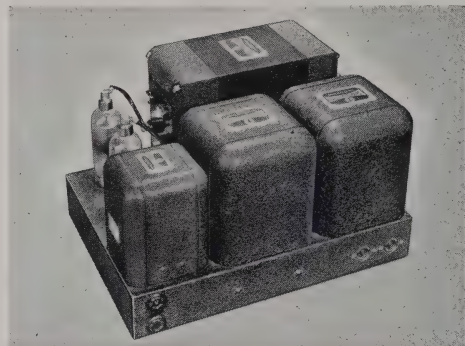
EXCITER UNIT

Chassis: 17" x 10" x 3"; Panel: 10 1/2"



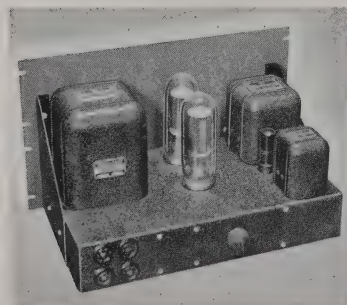
BIAS AND EXCITER POWER SUPPLIES

Chassis: 17" x 13" x 3"; Panel: 10 1/2"



R.F. POWER SUPPLY

Chassis: 20" x 15" x 3 1/4"; Panel: 14"



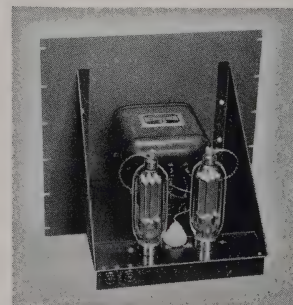
DRIVER AND SPEECH AMPLIFIER

Chassis: 17" x 10" x 3"; Panel: 10 1/2"



DRIVER AND SPEECH POWER SUPPLY

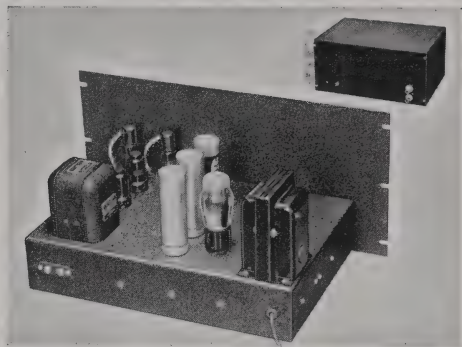
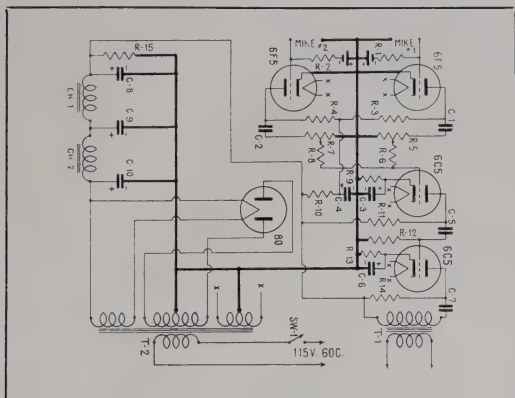
Chassis: 17" x 12" x 3"; Panel: 12 1/4"



CLASS B MODULATOR

Chassis: 13" w. x 13 1/2" d.; Panel: 19 1/4"

Transmitter Pre-Amplifier



PRE-AMPLIFIER CHASSIS AND ASSEMBLY
Chassis: 17" x 10" x 3"; Case: 19" x 13" x 8 3/4"

PRE-AMPLIFIER PARTS REQUIRED

Thordarson Transformers and Chokes:
T-1 T-15A71 CH-1 T-13C26
T-2 T-70R78 CH-2 T-13C26

Resistors:
R-1, R-2 5 Meg. 1/2 Watt IRC BT 1/2 or Equiv.
R-3 100,000 Ohm 1 Watt IRC BT1 or Equiv.
R-4 100,000 Ohm 1 Watt Ohmite or Equiv.
R-5 500,000 Ohm Volume Control IRC or Equiv.
R-6 500,000 Ohm 1/2 Watt IRC BT 1/2 or Equiv.
R-7 500,000 Ohm Volume Control IRC or Equiv.
R-8 500,000 Ohm 1/2 Watt IRC BT 1/2 or Equiv.
R-9 2,000 Ohm 1 Watt Ohmite or Equiv.

Resistors: (Cont'd.)
R-10 20,000 Ohm 1 Watt Ohmite or Equiv.
R-11 50,000 Ohm 1 Watt IRC BT1 or Equiv.
R-12 250,000 Ohm 1 Watt IRC BT1 or Equiv.
R-13 2,000 Ohm 1 Watt Ohmite or Equiv.
R-14 50,000 Ohm 1 Watt IRC BT1 or Equiv.
R-15 10,000 Ohm 25 Watt Ohmite or Equiv.

Condensers:
C-1, C-2 .1 Mfd. 400 Volt paper Aerovox 484 or Equiv.
C-3 10 Mfd. 25 Volt Elect. Aerovox PB25 or Equiv.
C-4 8 Mfd. 450 Volt Elect. Aerovox G475 or Equiv.
C-5 .1 Mfd. 400 Volt paper Aerovox 484 or Equiv.

Condensers: (Cont'd.)
C-6 10 Mfd. 25 Volt Elect. Aerovox PB25 or Equiv.
C-7 .1 Mfd. 400 Volt Paper Aerovox 484 or Equiv.
C-8 to C-10 8 Mfd. 450 Volt Elect. Aerovox G475 or Equiv.

Miscellaneous Parts:
2 Mike Connectors Amphenol or Equiv.
1 Bakelite Socket Amphenol or Equiv.
4 Bakelite Octal Sockets Amphenol or Equiv.
2 Bakelite Knobs
1 Terminal Strip

Tubes: 1-80, 2-6F5, 2-6C5

Thordarson Technical Literature

No. 333 — Amateur Radio75c Postpaid

Mr. Fortune, Thordarson engineer and a prominent amateur radio enthusiast, spent over twelve months in preparing this text-book. There are approximately 160 pages, and matters covered include Learning the Code, Receiver Theory and Construction, Crystal Oscillator Transmitter, Two-stage Transmitter, Three-stage Transmitter, Construction of the Modulator and reference notes on receivers, inductance, capacity and many other electrical and radio terms. It is a book recommended to all experimenters, beginning amateurs and even to amateurs of long experience. Amateur net price 75c. Profusely illustrated with over 100 comprehensive photographs and drawings. Heavy cover finished in wear-resistant blue cloth, with attractive gold stamping. This is a cloth covered case bound text-book.

No. 340 — Complete Transformer Manual 35c Postpaid

The Thordarson Transformer Manual is a complete book, containing the Replacement Transformer Encyclopedia and Servicing Guide, the Transmitter Guide, and the Sound Amplifier Guide, plus current Thordarson catalogs. It is bound in a strong attractive blue and orange cover with loose-leaf arrangement, giving the user opportunity to keep the Manual up-to-date by adding later Thordarson releases. A book that has proven to be most popular in the technical library.

No. 352—Replacement Encyclopedia, Service Guide, Free

Thordarson Replacement Transformer Encyclopedia and Service Guide No. 352 recommends proper transformer and choke replacement for receivers listed in Rider's Manuals. This handy, useful time-saver, originated by Thordarson is now used by good service engineers the world over. In addition, it contains a new edition of the popular Service Guide giving practical solutions to everyday service problems, including useful charts and tables.

No. 346 — Amplifier Guide 15c Postpaid

P. A. men and experimenters interested in building high quality amplifiers find the Thordarson Amplifier Guide No. 346 a worthwhile source of information. It contains laboratory designed and tested circuits of amplifiers from 8 to 120 watts output. Complete parts list, mechanical chassis drawings, and comprehensive illustrations enable the constructor to obtain superior results with matched transformer and choke components. Data is included for pre-amplifiers, dual tone controls, speaker impedance matching and testing.

No. 500 — Broadcast Components Catalog Free

Thordarson offers a complete line of transformers and chokes for broadcast use, each capable of meeting and surpassing the most rigid broadcast tolerances. These transformers are listed and described in the new Broadcast Catalog, No. 500. Broadcast stations, experimenters, laboratories or air craft stations are urged to secure a copy of this valuable listing.

No. 600 — Amplifier Catalog Free

The finest amplifiers are built by Thordarson — pioneers in producing quality audio components. Absolute fidelity is assured by accurate laboratory design and rigid inspection during production. New models from 8 to 900 watts satisfy practically every sound requirement. Pre-amplifiers and boosters round out a truly complete line of equipment for sound technicians. Fully described in Catalog 600.

No. 400 — Complete Transformer Catalog Free

A catalog of transformers and reactors for every radio use. Contains full physical and electrical descriptions.

Obtainable from your radio parts distributors or direct from factory.



TRANSFORMER SPECIALISTS SINCE 1895



Class B Output Calculations

Class B Audio Frequency Amplifiers

CLASS B modulators are usually used in transmitters having plate modulated Class C inputs of more than 50 or 60 watts. For audio frequency power outputs of more than 30 watts, the increased cost and size of tubes which can be used in Class A amplifiers, and the power supply components used to supply these tubes make Class B systems economically justifiable.

The principal differences between Class A and Class B audio amplifiers are as follows:

1. The plate dissipation of the tubes in a Class B amplifier increases with increasing signals and is a maximum at some level near full power output. In a Class A amplifier the plate loss of the tubes is a maximum at no-signal.
2. The excitation of a Class B amplifier is carried into the positive grid region of the tube characteristics, causing grid current to flow, with the resultant requirement that the source of audio frequency excitation is called upon to deliver an appreciable amount of power. Class A amplifiers, in general, are not designed to operate with a positive grid in any condition of normal excitation.
3. In a Class B amplifier the changing plate current requires better regulation of the power supply than does the Class A amplifier.
4. Class A amplifiers usually require negative bias on the grids. In many Class B amplifiers there are conditions of operation in which no bias is required.
5. Class B audio frequency amplification requires the use of two tubes, whereas Class A amplification can be obtained with one tube.

Class B Audio Frequency Output Calculations

The amateur has many occasions in which it is desirable to have more data concerning the operation of given tubes in Class B service than are given by the tube manufacturers. The data which are given usually show typical operating characteristics at a given plate voltage, showing the plate load which delivers a given amount of power with nominal distortion, driving power, and tube losses.

In a particular installation there often arise circumstances in which operation in some condition other than the "typical" case is desirable. For ex-

ample: (1) the plate supply voltage may be other than that listed; (2) more or less distortion may be tolerated; (3) greater tube losses may be permissible at full-signal or at no-signal; (4) the regulation of the source of driving voltage may be poor; (5) the voltage or power output capabilities of the driving source may be limited; (6) the output power requirements may be different; (7) the wave form of the signal may be unusual; (8) the operation may be intermittent; and (9) space and weight requirements may justify overloading.

So that the amateur may take full advantage of the possibilities of varying the plate load on his Class B tubes by changing connections on the Multi-Match modulation transformers, an example of Class B output calculations is shown below:

Suppose that a Class C amplifier of 330 watts input is to be 100% modulated by the tubes having the characteristics shown in Fig. 1. The plate

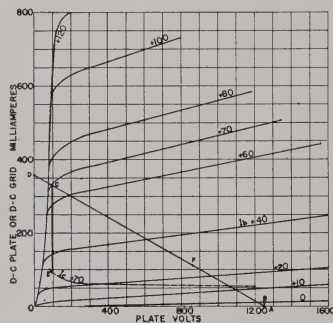


Fig. 1

supply voltage is 1250 V.; the rated maximum tube dissipation is 40 watts, and the maximum plate current is 125 MA.

The audio frequency requirement is that 165 average watts of output power be delivered to the Class C stage. This figure is based on a sine wave signal. The maximum allowable power input to the modulator (two tubes) is $1250 \times 0.125 \times 2 = 312.5$ watts. Thus an overall efficiency of at least

$$100 \times \frac{165}{312}$$

or 52.5% is required. This is not at all unreasonable for a Class B audio frequency stage; in an amplifier of power output capabilities of 150 watts an overall efficiency of 60 to 65% is easily obtainable.

Practice has shown that to allow for transformer losses and the deviation of tube characteristics from average values, the value of power delivered by the tubes as calculated from their aver-

age characteristics should be, for outputs of this order of magnitude, about 16% higher than the power required to be delivered from the secondary of the modulation transformer. In this case, the calculations should be based on a power output from the tubes of 165×1.16 or 192 watts output.

Since the maximum plate loss in a Class B amplifier occurs at a level slightly below maximum power output, an allowance of 35 average watts loss per tube at full signal is reasonable in this example. Considerable leeway may be taken with this in cases where speech waves of 330 watts peak power are required at the output of the modulation transformer. However, in this example, it is assumed that sine wave modulation will occur.

The power input to the two tubes at full-signal will then be the sum of power output and tube losses. This is $192 + (2 \times 35)$ or 262 watts. A check now shows that the Class B plate efficiency, that is, the efficiency of conversion from DC energy supplied to the plate to audio frequency energy, is

$$100 \times \frac{192}{262} \text{ or } 73\%.$$

This is a reasonable value, for the maximum possible efficiency of a Class B stage is 78.5%.

For a power input of 262 watts at 1250 volts the direct current supplied is $\frac{\text{watts}}{\text{volts}}$ or $\frac{262}{1250}$ or 210 MA. The average current in each tube is half of this amount, or 105 MA. With the tubes biased to a value near cut-off, the shape of the current wave in each tube very nearly approximates that of a half-sine wave.

The average value of current in a series of half-sine wave pulses is 31.8% of the peak value of the current. Therefore, the peak value of the current in the tube is $\frac{105}{0.318}$ or 330 MA.

At the time the peak power occurs, only one of the two modulator tubes is working, and, therefore, it alone is delivering this power. The peak power is twice the average AC power developed or 2×192 or 384 watts. The peak AC voltage across the load is $\frac{\text{peak watts}}{\text{peak current}} = \frac{384}{0.330} = 1160$ volts.

The AC load on the tube is the peak voltage divided by the peak current or $\frac{1160}{0.330} = 3500$ ohms. On the family of curves shown in figure 1, the oblique straight line AD is known as the load line. It is a plot of the instantaneous voltage and current relations for one Class B tube when working into a resistive load of 3500 ohms. The

Class B Output Calculations

location of the line is found by locating any two sets of simultaneous values of plate voltage and plate current. The value of 1160 peak volts across the load and 330 MA in the tube corresponds to a value of 1250 — 1160 or 90 volts across the tube. Thus $e = 90$ volts and $i = 330$ MA is one set of points. It is located at point C. Then, knowing the load, any other set of points can be found. At one-ninth power output the peak current and the peak voltage are one-third of that occurring at full power output. At this power level, then, the peak current is 110 MA, and the peak voltage across the load is $\frac{1160}{3}$ or 387. This corresponds to a peak voltage across the tube of 1250 — 387 or 863 V. Thus another point on the load line is $e = 863$ volts and $i = 110$ MA. This point is shown at F. A straight line through C and F locates the load line.

A simpler way of locating the load line is to draw a line through the point 1250 volts on the abscissa axis, which is shown at point A, and the point $\frac{1250}{R}$ or $\frac{1250}{3500}$ or 0.357 ampere on the ordinate axis. This latter point is designated as D. Then the points A, C, D and F are on the load line, and any two of them might have been used to obtain its position on the family of curves shown.

It will be seen that the point C falls on the curve corresponding to a grid voltage of +70 V. This voltage of +70 is the voltage on the grid at the instant of minimum plate voltage and peak power output. It (+70 volts) is the most positive value of grid voltage required for this condition of operation. It is to be noted that the maximum grid voltage and the minimum plate voltage occur at the same instant; furthermore, the minimum plate voltage of 90 V. is only slightly greater than the maximum grid voltage of 70 V.

The load of 3500 ohms on the plate of one audio tube represents a plate-to-plate load of four times this or $4 \times 3500 = 14,000$ ohms. This plate-to-plate impedance is of no particular value in the calculation of Class B performance by the method outlined above, but it is useful in describing the characteristics of the required Class B output transformer.

The calculation shown has been that for the solution of the operating characteristics for a given power output with a given tube loss. Where it is desired to find operating conditions to meet other requirements, such as a specified plate load or a specified peak driving voltage, a different order of procedure must be used. A study of the above ex-

ample will be a guide in other solutions.

Whether or not the tubes are to be operated at zero bias involves the consideration of the plate loss at no-signal and the tolerable distortion. In the example given the value of no-signal plate current for zero bias voltage may be found at the intersection of the 1250 volt ordinate and the curve for $E_c = 0$. This is shown at the point B. Here the current for one tube is 10 MA, and the plate loss per tube is 1250×0.010 or 12.5 watts, well below the allowable limit.

The dotted curve represents the relation of grid current to plate voltage for a grid voltage of +70 volts. If from the coordinates $E_p = 90$, $I_p = 330$, a vertical line is passed which intersects the dotted line at E, the ordinate (90 MA) at this point represents the peak value of grid current. The peak grid driving power required to obtain full output under the conditions specified may now be obtained. It is $E_g \times I_g = 70 \times 0.090 = 6.3$ watts. The ratio of peak driving power to average driving power depends mainly upon the plate load, the type of tube, and the peak grid voltage and its relation to the minimum plate voltage. For some conditions of operation the average power is one-half the peak power, and for other conditions it may be only one-third or one-fourth the peak power.

The following characteristics have thus been obtained for two tubes in a Class B stage:

- Plate voltage — 1250 volts
- Average no-signal plate current — 20 MA
- Average full-signal plate current — 210 MA
- DC grid volts — 0
- Peak grid-to-grid voltage — 140 volts
- No-signal plate loss — 25 watts
- Full-signal plate loss — 70 watts
- Load resistance (per tube) — 3500 ohms
- Plate-to-plate load — 14,000 ohms
- Peak driving power — 6.3 watts
- Plate efficiency — 73%
- Stage efficiency — 65%
- Power output — 165 watts

The maximum efficiency of a Class B amplifier is 78.5%. This value is realized only when the instantaneous plate voltage swings to zero and the half-sine wave shape of current in each tube is retained.

In the example given, if such a condition could be obtained, the average plate current (two tubes) would be $0.357 \times 0.318 \times 2 = 0.227$ ampere. The power output would be $0.357 \times \frac{1250}{2} = 223$ watts, and the power input would be $1250 \times 0.227 = 284$ watts for an efficiency of $100 \times \frac{223}{284}$ or 78.5%.

Considerations in Selecting Driver Transformer Ratios

Although the driving power for a Class B stage is usually obtained from a Class A amplifier, ordinary Class A amplifier design for maximum power output does not suffice. Most Class A amplifiers not intended for driver service are planned to deliver the maximum possible undistorted power into a given fixed load.

Unfortunately, the load on Class A tubes in driver service is not constant throughout the cycle. This is due to the fact that the grids of the modulator tubes do not have a constant resistance over the audio cycle. In the positive grid region the grid current increases more rapidly than the grid voltage, thus exhibiting the characteristic of a decreasing grid resistance with increasing voltage. The degree to which the resistance changes depends mainly upon the relation between minimum plate voltage and maximum grid voltage. For tubes operated with zero bias the resistance change in most cases is, fortunately, not large. In a Class B stage working into a resistance load, the maximum instantaneous grid voltage and the minimum instantaneous plate voltage occur at the same time. During the part of the cycle that the minimum plate voltage and the maximum grid voltage are not greatly different, the change in grid-to-cathode resistance is most apparent. It is well to plan to have the ratio of minimum plate voltage to maximum grid voltage exceed two in cases where low driver distortion is desired. In instances where more driver distortion can be tolerated, or in cases where the apparent internal output impedance of the driver is very low, as compared with the minimum Class B grid resistance, this ratio may be reduced to 1.0 or 1.5. With tubes having negative grid bias the resistance changes from a very high value to a very low value within a small per cent of the time required for a complete cycle.

If a driving voltage of perfect regulation were available, this change in resistance would not be of such serious consequence. However, all practical drivers have some internal impedance, and in delivering energy to a varying load, harmonic distortion will occur. If the internal output impedance of the driver has an appreciable reactance, extremely disagreeable distortion can result. This is especially true if the Class B grids are biased. It is important to have a driver transformer having a low leakage reactance.



Driver Transformer Ratios

AN IMPORTANT problem in the selection of a driver is to obtain a source of adequate voltage of good regulation without prohibitive amounts of driver tube capacity. Fortunately, there are receiving tubes (2A3's) which will supply driving power for most modulators having power outputs up to several hundred watts.

In general, for amateur work, the amateur should use tubes which in normal Class A amplifier service will deliver an average power output of at least one-half as much as the peak power required to supply the Class B grids. It is preferable in nearly all cases to have the average power output capabilities of the driver be one to two times as great as the peak power requirements of the Class B grids. This corresponds to peak power capabilities of two to four times the peak power which is required at the driver grids. The ratio of average power capacity of driver to peak power required at the Class B grids may approach the lower value when the Class B tubes are operated at zero bias and the ratio of minimum plate voltage to maximum grid voltage is large (two or more). In such a case, the grid resistance is substantially constant during the cycle.

The installation of driving tubes having power output capabilities greater than required allows the changing of the plate load from that which is optimum for maximum undistorted output to a higher value which delivers less power, but which lowers the internal impedance of the driving source as seen from the Class B grids.

In selecting the turns ratio of a driver transformer, it is desirable to make the step-down ratio as high as possible from the driver plates to the Class B grids and yet be able to develop the required peak driving voltage on the Class B grids without overloading the driver tube.

The determination of the correct driver transformer ratio can be studied by reference to the following discussion. In figure 2, E_g is the peak value of the AC voltage required on the Class B grid. R_g is the grid resistance at this value of voltage. (This is the lowest value of grid resistance.) R_D is the internal resistance of the source of

driving energy, and E_D is the peak open circuit voltage developed by the driver source. The transformer ratio is N to 1, primary to secondary. Figure 3 is a simplified version in which the secondary voltage and resistance are

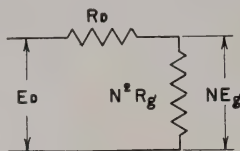


Fig. 3

reflected to the primary side of the transformer. The secondary voltage is stepped up N times and appears across the primary as $N E_g$. The secondary load, in accordance with regular transformer theory, is stepped up N^2 times and appears to the primary as $N^2 R_g$.

At all instants the ratio of the voltages is equal to the ratio of the resistances across which they occur. Thus:

$$\frac{E_D}{N E_g} = \frac{R_D + N^2 R_g}{N^2 R_g}$$

There are two solutions, one giving a turns ratio which gives relatively good regulation and the other giving a turns ratio with poor regulation. For either solution there is adequate driving voltage. The desired solution is given by the formula:

$$N = \frac{E_D R_g + \sqrt{E_D^2 R_g^2 - E_g^2 R_g R_D}}{2 E_g R_g}$$

Example:

Assume a pair of push-pull 2A3's with 300 volts on the plates, 60 volts bias and an available signal of 53 peak volts on each 2A3 grid. The Class B grid minimum resistance is 780 ohms at +70 volts. The Class B tubes are at zero bias. The 2A3 tubes have a μ of 4.2 and a plate resistance of 1050 ohms.

Solution:

The open circuit driving voltage of two 2A3's in series is $2 \times 4.2 \times 53$ or 445 volts. This voltage may be considered as that in a generator of internal resistance $R_p \times 2$ or 1050×2 or 2100 ohms. Then:

$$N = \frac{445 \times 780 + \sqrt{(445)^2 (780)^2 - (70)^2 (780) (2100)}}{2 \times 70 \times 780}$$

Solving:

$N = 6.25$, which is the turns ratio from the total primary to one-half the secondary. In this case, the 780 ohm grid load is reflected as a 30,500 ohm plate-to-plate load on the 2A3's, much higher than the 5000 ohm plate-to-plate load often encountered.

Line to Class B Grid Driver Ratio

In selecting the driver transformer to transfer energy from a so-called "500 ohm" line to Class B grids, the fact is often overlooked that the "500 ohm" line is usually not of 500 ohms internal output resistance. Its internal output resistance (when the source of energy to it is not "padded down") is usually far from being 500 ohms. This is of considerable consequence in calculating driver transformer ratios.

Suppose, for example, that the "500 ohm" line had been fed from two 2A3's having an amplification factor of 4.2, a plate resistance of 1050 ohms and a maximum available signal voltage on their grids of 53 peak volts. If the 2A3 output transformer was designed to place a 5000 ohm plate-to-plate load on the tubes when a 500 ohm load was connected to the secondary, the turns ratio of total primary to total secondary would be 3.16 to 1. The 500 ohm line would then have an internal impedance of $\frac{2 \times 1050}{(3.16)^2}$

or 210 ohms, and the maximum available open circuit voltage on the line side of the transformer would be

$$2 \times 53 \times \frac{4.2}{3.16} \text{ or } 140 \text{ peak volts. This}$$

voltage and the source resistance of 210 ohms should be used in calculating the line to Class B grid ratio.

For the Class B grid condition previously given, the solution yields:

$$N = \frac{140 \times 780 + \sqrt{(140)^2 (780)^2 - (70)^2 (210) (780)}}{2 \times 70 \times 780}$$

which gives $N = 1.97$ as the ratio from the line to one grid (that is, the primary to one-half the secondary). It is to be noted that this ratio (1.97) multiplied by the ratio of the transformer with which it is associated (3.16) gives $1.97 \times 3.16 = 6.25$, which is the ratio obtained for the solution of turns ratio for a driver transformer coupling the 2A3 plates directly to the grids.

In the calculation of driver ratio shown, no allowance has been made for transformer losses or for deviations of the driver tube characteristics from the average values given by tube manufacturers. Furthermore, it is not well to have a peak signal on the driver tube grids which reduces that grid voltage to zero. It is better to limit the maximum peak grid voltage on the driver to about 95% of the bias voltage. Allowance for these three factors can be made by reducing the step-down ratio of the driver transformer 10 to 15%.

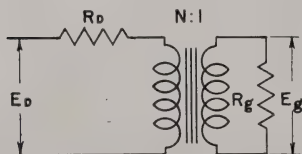


Fig. 2

Matching Class C Loads to Modulators

HAVING selected the proper load resistance into which the modulator should deliver energy it is necessary to couple the modulator to its Class C load through a transformer of the proper turns ratio.

It is characteristic of a transformer that the resistance to which the secondary delivers energy can appear as a different value of resistance at the primary terminals. The degree to which this actual load resistance and the reflected load resistance differ depends upon the turns ratio of the transformer. Of the total energy supplied to the primary of a transformer almost all is available for delivery to the load on the secondary. Thus, the actual load resistance presented by the Class C amplifier may be made to appear as the desired load on the modulator tubes, and all of the alternating current energy developed in the modulator stage can be delivered to the Class C amplifier and its load. In general, then, a transformer may be thought of as an impedance changing device in which very little of the energy supplied to it is lost. In amateur work, the transformers are of such size and construction that the efficiency is good enough that little attention need be given to the losses; that is, for most calculations it may be assumed to behave as an ideal transformer.

To show how a transformer acts as an impedance changing device the following demonstration is given:

Referring to Figure 4 a transformer is shown having a turns ratio of primary to secondary of 1 to N. The load

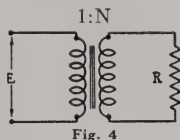


Fig. 4

on the secondary is R ohms, and the voltage impressed on the primary is E.

Ordinary transformer theory indicates that the voltage across each winding is proportional to the number of turns on the winding. Thus, with E volts across the primary, the voltage across the secondary is N times as much, or NE. The power at the load resistance R is equal to the square of the voltage across it divided by the resistance. Thus, in this case the power at the secondary load is $\frac{(NE)^2}{R}$.

With a perfect transformer the power at the primary is the same value as it is at the secondary. Thus, the power at the primary is also $\frac{(NE)^2}{R}$.

For the moment, assume the secondary load resistance, R, appears at the primary terminals as another resistance, R_1 . It is desired to find the value of the turns ratio of secondary to primary in terms of these resistances, R and R_1 . The power at the primary of the transformer is $\frac{E^2}{R_1}$. But this value

is also equal to $\frac{(NE)^2}{R}$. Therefore,

$$\frac{E^2}{R_1} = \frac{(NE)^2}{R} \text{ or } \frac{1}{R_1} = \frac{N^2}{R} \text{ and } N^2 = \frac{R}{R_1}$$

Thus, it is to be seen that the reflected resistance is equal to the secondary resistance divided by the square of the turns ratio from secondary to primary. Stated in another manner, the reflected resistance is equal to the secondary resistance multiplied by the square of the turns ratio from primary to secondary. It is important not to become confused by the indiscriminate use of the terms "turns ratio," "step-up ratio" and the like. These terms are used interchangeably, but they are not necessarily equal to each other.

Suppose, for example, that it is desired to calculate the turns ratio of the full primary to the full secondary of a modulation transformer used under the following conditions:

Power input to Class C amplifier — 330 watts.

Plate voltage on Class C amplifier — 1250 volts.

Modulator plate-to-plate load desired — 14000 ohms.

The Class C plate current is $\frac{W}{E}$ or $\frac{330}{1250}$ or 0.264 amperes. The Class C load on the secondary of the modulation transformer is then $\frac{E}{I}$ or $\frac{1250}{0.264}$ or 4740 ohms. This is equal to R.

Then, if $N^2 = \frac{R}{R_1}$, $N^2 = \frac{4740}{14000} = 0.338$ and N is equal to the square root of this value, or 0.58. In this case N is the ratio of secondary turns to primary turns. The value of 0.58, being less than unity, indicates that the secondary has less turns than the primary. This is as it should be when a given Class C load is less than the plate-to-plate load which it is desired be reflected on the primary side of the modulation transformer. The amateur may avoid making the mistake of obtaining a turns ratio which is the inverse of the proper value by always making an estimate of which winding, primary or secondary, has the greater number of turns, this estimate to be made before the start of calculations.

MULTI-MATCH MODULATION

TRANSFORMER RATIOS

Tapped double winding coils as used in Multi-Match modulation transformers make possible a large number of impedance ratios, so many in fact that it is not practical to list in table form all the combinations possible. However, there are occasions when the modulator plate-to-plate load, or the Class C load, are of values not shown in the table and yet are within the range covered by the transformer. The chart shown on the opposite page may be used to determine the correct modulation transformer connections when the desired turns ratio is known. The transformer connections may then be found from the list of ratios in the adjoining table. As an example, to match a 10,000 ohm plate-to-plate load to a Class C load of 5000 ohms, a turns

ratio of $\sqrt{\frac{10,000}{5,000}}$ or 1.41 is necessary.

The connections shown in the table should be used to secure this ratio. In this particular case these connections are:

For the primary, connect the modulator plates to terminals 2 and 5; 3 and 4 are joined and connected to the modulator plate supply. For the secondary, join terminals 7-11 and 8-12. Connect the Class C load to terminals 7 and 8.

Since only part of the winding is used for some combinations, the maximum allowable value of plate-to-plate load is necessarily variable. This maximum value is shown in the last column of the table and should not be exceeded.

Care should be taken that the DC secondary current does not exceed the maximum rating of the transformer. A parallel connected secondary will carry twice the current of a series connection, and in the event that the Class C current is greater than the allowable current of the series connection, a parallel connection must be used.



TRANSFORMER SPECIALISTS SINCE 1895

THORDARSON

—Connections for Matching Multi-Match and Universal Transformers—

Turns Ratio Primary to Secondary	PRIMARY			SECONDARY				Maximum Allowable Plate to Plate Load
	Plate	B +	Plate	SERIES		PARALLEL		
				Join Together	Connect Class "C" Load To	Join Together	Connect Class "C" Load To	
3.14	2	3-4	5			8-9 10-11	8-10 —	12000 Ohms
2.88	7	8-11	12			2-3 4-5	2-4 —	16000 Ohms
2.8	1	3-4	6	9-10	8-11			20000 Ohms
2.61	7	9-10	12	2-5	1-6			20000 Ohms
2.5	1	2-5	6			8-9 10-11	8-10 —	10000 Ohms
2.5	1	3-4	6			7-11 8-12	7-8 —	20000 Ohms
2.32	7	9-10	12			1-3 4-6	1-4 —	20000 Ohms
2.07	7	9-10	12	3-4	2-5			20000 Ohms
1.8	7	8-11	12	2-5	1-6			16000 Ohms
1.73	1	3-4	6			7-9 10-12	7-10 —	20000 Ohms
1.61	8	9-10	11			2-6 1-5	1-2 —	8000 Ohms
1.60	7	8-11	12			1-3 4-6	1-4 —	16000 Ohms
1.59	7	9-10	12	2-3	1-6			20000 Ohms
1.57	2	3-4	5	9-10	8-11			12000 Ohms
1.49	7	9-10	12	3-4	2-6			20000 Ohms
1.44	7	8-11	12	3-4	2-5			16000 Ohms
1.4	2	3-4	5			7-11 8-12	7-8 —	12000 Ohms
1.32	1	3-4	6	9-10	8-12			20000 Ohms
1.28	8	9-10	11			2-3 4-5	2-4 —	8000 Ohms
1.25	1	3-4	6	8-11	7-12			20000 Ohms
1.25	1	2-5	6	9-10	8-11			10000 Ohms
1.15	7	9-10	12	3-4	1-6			20000 Ohms
1.11	1	2-5	6			7-11 8-12	7-8 —	10000 Ohms
1.1	7	8-11	12	2-3	1-6			16000 Ohms
1.03	7	8-11	12	3-4	2-6			16000 Ohms
1.02	1	3-4	6	8-9	7-12			20000 Ohms
.967	2	3-4	5			7-9 10-12	7-10 —	12000 Ohms
.866	1	3-4	6	9-10	7-12			20000 Ohms
.8	7	8-11	12	3-4	1-6			16000 Ohms
.77	1	2-5	6			7-9 10-12	7-10 —	10000 Ohms
.742	2	3-4	5	9-10	8-12			12000 Ohms
.714	8	9-10	11			1-3 4-6	1-4 —	8000 Ohms
.7	2	3-4	5	8-11	7-12			12000 Ohms
.639	8	9-10	11	3-4	2-5			8000 Ohms
.588	1	2-5	6	9-10	8-12			10000 Ohms
.575	2	3-4	5	8-9	7-12			12000 Ohms
.555	1	2-5	6	8-11	7-12			10000 Ohms
.495	8	9-10	11	2-3	1-6			8000 Ohms
.483	2	3-4	5	9-10	7-12			12000 Ohms
.458	8	9-10	11	3-4	2-6			8000 Ohms
.455	1	2-5	6	8-9	7-12			10000 Ohms
.385	1	2-5	6	9-10	7-12			10000 Ohms
.357	8	9-10	11	3-4	1-6			8000 Ohms

Thordarson Multi-Match Transformer Ratings

Type No.	Max. Audio Watts	Max. Pri. M.A. Each Side	Max. Sec. M.A. Series	Max. Sec. M.A. Parallel
T-11M74	40	100	80	160
T-11M75	75	145	145	290
T-11M76	125	210	160	320
T-11M77	300	250	250	500
T-11M78	500	320	320	640
T-19M13	15	50	50	100
T-19M14	30	75	75	150
T-19M15	60	125	125	250
T-19M16	100	175	175	350
T-19M17	250	225	225	450



TRANSFORMER SPECIALISTS SINCE 1895



Matched Power Supplies.

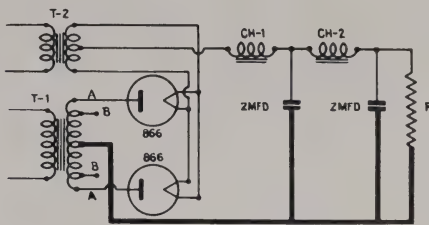
THESE matched power supplies provide the amateur with any of the direct current voltages ordinarily encountered in amateur radio work. The dual transformers T-19P57, T-19P70 and T-19P71 are especially useful for transmitters having low voltage exciter and high voltage final amplifier stages on the same chassis. The transformer T-19P58 is especially useful in transmitters with a Class B modulator and Class C amplifier having slightly different plate voltage requirements. All of them may be depended upon to give the rated direct current voltage and current when using the prescribed chokes.

For CW work or for use in transmitters where the Class B modulator and Class C amplifier plate voltage are to be taken from one supply, the excellent regulation of these matched units is desirable. When the bleeder, R, is of such magnitude as to drain approximately 10% of the rated current, the regulation of these supplies is approximately 15% and the ripple is approximately 1%.

The power supplies using the transformer T-1, marked with an asterisk, are dual supplies; that is, power is supplied at two direct current voltages simultaneously. The dual supplies using the transformers T-19P58 and T-19P71 use two chokes in each B+ lead, and the proper chokes are specified opposite these transformers. For the dual supplies using the transformers T-19P57 and T-19P70, two chokes in the high voltage center tap connection provide filtering for both the direct current voltages obtainable. The rated secondary load currents of each of these four dual plate transformers may be delivered simultaneously. But, when it is desired to use only the low voltage tap on any one of these dual units, the current rating of this tap is then equal to the sum of the current ratings of the two sections.

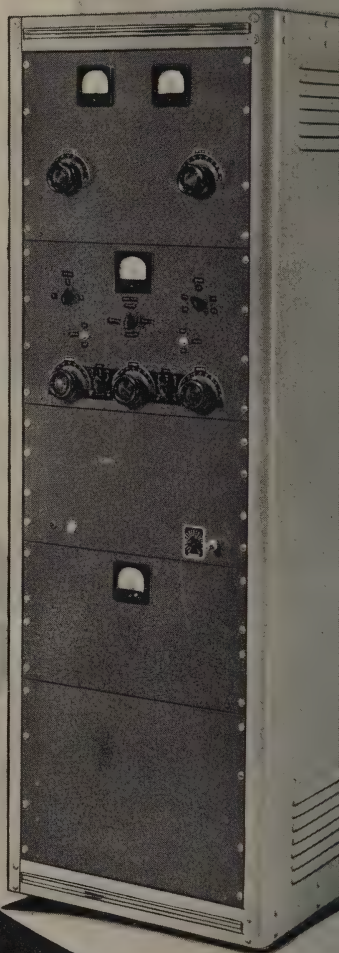
The filament transformer chosen for each plate supply is designed for mounting underneath the chassis. The plate transformers and chokes are supplied with black cases to provide not only matched electrical performance but also matched appearance in the rig.

The T-19F83 filament transformer supplies the filament of a 5Z3, the T-19F88 is for 866JR's and the T-19F90 is for 866's. The T-19F78 filament transformer is to be used with a 5Z3 and 866JR's.



Power Trans. T-1	DC Volts from Tap A	DC Volts from Tap B	DC MA	Input Choke CH-1	Smoothing Choke CH-2	Fil. Trans. T-2
T-19P54	400		150	T-19C39	T-19C46	T-19F83
T-19P55	500	400	250	T-19C36	T-19C43	T-19F88
T-19P70*	750	400	100 225	T-19C36	T-19C43	T-19F88 T-19F83
T-19P56	750	600	225	T-19C36	T-19C43	T-19F88
T-19P57*	1000	400	125 150	T-75C51	T-75C51	T-19F78
T-19P58*	1000	750	200 150	T-19C35 T-19C39	T-19C42 T-19C46	T-19F90 T-19F88
T-19P69	1000	750	300	T-19C36	T-19C43	T-19F90
T-19P71*	1250	400	125 200	T-19C39 T-19C35	T-19C46 T-19C42	T-19F90 T-19F83
T-19P59	1250	1000	300	T-19C36	T-19C43	T-19F90
T-19P60	1500	1250	300	T-19C36	T-19C43	T-19F90
T-19P61	1750	1500	300	T-19C36	T-19C43	T-19F90
T-19P62	2000	1750	300	T-19C36	T-19C43	T-19F90
T-19P63	1250	1000	500	T-19C38	T-19C45	T-19F90
T-19P64	1500	1250	500	T-19C38	T-19C45	T-19F90
T-19P65	2500	2000	300	T-19C36	T-19C43	T-19F90
T-19P66	1750	1500	500	T-19C38	T-19C45	T-19F90
T-19P67	2000	1750	500	T-19C38	T-19C45	T-19F90
T-19P68	2500	2000	500	T-19C38	T-19C45	T-19F90





THORDARSON ELECTRIC MFG. CO.
500 W. Huron St. Chicago, Ill. U.S.A.

Transformer Specialists Since 1895

THORDARSON OSCILLOSCOPE PARTS LIST

"Build It Yourself"

THORDARSON FOUNDATION UNIT AND ACCESSORIES

T-11K99 Foundation Unit (Consists of punched chassis, panel, light shield, etched panel, ventilated cabinet and 2" magnifying lens with retainer ring, and complete circuit with constructional and operating data). In addition to the foundation unit, one T-92R33 power transformer (see below) and one T-74C30 filter choke are required.

THORDARSON TRANSFORMERS AND CHOKES

	List Price
I T-92R33 Power Transformer	4.00
I T-74C30 Choke	1.50

913 CATHODE RAY OSCILLOSCOPE CONTROLS

Number Ohms	Type	List Price
R-1 500,000	Potentiometer (Centralab #70203 or equivalent)	\$1.00
R-2 500,000	Potentiometer (Centralab #70203 or equivalent)	1.00
R-2 1,000,000	Potentiometer (Centralab #72116 or equivalent)	1.00
R-10 100,000	Potentiometer (Centralab #72104 or equivalent)	1.00
R-11 100,000	Potentiometer (Centralab #72104 or equivalent)	1.00
R-12 50,000	Potentiometer (Centralab #72103 or equivalent)	1.00
R-13 25,000	Potentiometer with switch (Centralab #82111 or equivalent)	1.50
R-14 3,000,000	Potentiometer (Centralab #72132 or equivalent)	1.00
S-1	2-pole, 2-position switch (Centralab #1405 or equivalent)	1.15
S-2	2-pole, 3-position switch (Centralab #1405 or equivalent)	1.15
S-3	1-pole, 5-position switch (Centralab #1401 or equivalent)	1.15

RESISTORS

Number Ohms Watts	Type	List Price
R-3 5,000	I.R.C. or equivalent	.20
R-4 5,000	I.R.C. or equivalent	.20
R-20 5,000	I.R.C. or equivalent	.20
R-5 500,000	I.R.C. or equivalent	.20
R-6 500,000	I.R.C. or equivalent	.20
R-7 2,000,000	I.R.C. or equivalent	.20
R-8 2,000,000	I.R.C. or equivalent	.20
R-9 75,000	I.R.C. or equivalent	.20
R-15 50,000	I.R.C. or equivalent	.20
R-16 750,000	I.R.C. or equivalent tolerance 5%	.20
R-17 40,000	I.R.C. or equivalent	.75
R-18 8,000	I.R.C. or equivalent	.20
R-19 800	Electrad A8 or equivalent	.50
R-21 200	I.R.C. or equivalent	.20

List Price

TUBES	Net Price
1 Type 913 Tube	\$4.00
1 Type 1-V Tube	.54
2 Type 6J7 Tubes @ 72c each	1.44
1 Type 885 Tube	2.00
1 Type 6X5 Tube	.90

CONDENSERS

Number Mfds. Voltage	Type	List Price
C-1 .1 400	Aerovox 484 or equivalent	.20
C-4 .1 400	Aerovox 484 or equivalent	.20
C-5 .1 400	Aerovox 484 or equivalent	.20
C-6 .1 400	Aerovox 484 or equivalent	.20
C-18 .1 400	Aerovox 484 or equivalent	.20
C-2 .003 200	Aerovox 284 or equivalent	.14
C-3 .003 200	Aerovox 284 or equivalent	.14
C-7 8 525	Electrolytic (Aerovox GL55 or equivalent)	1.05
C-8 8 525	Electrolytic (Aerovox GL55 or equivalent)	1.05
C-9 8 525	Electrolytic (Aerovox GL55 or equivalent)	1.05
C-10 8 250	Electrolytic (Aerovox GL5250 or equivalent)	.95
C-11 25 25	(Aerovox PB25 or equivalent)	.65
C-12 .5 400	Aerovox 484 or equivalent	.35
C-13 .5 400	Maximum Tolerance $\pm 10\%$ (Aerovox or equivalent)	.35
C-14 .13 400	Maximum Tolerance $\pm 10\%$ (Aerovox or equivalent)	.25
C-15 .04 400	Maximum Tolerance $\pm 10\%$ (Aerovox or equivalent)	.15
C-16 .007 400	Maximum Tolerance $\pm 10\%$ (Aerovox or equivalent)	.60
C-17 .0014 400	Maximum Tolerance $\pm 10\%$ (Aerovox or equivalent)	.30

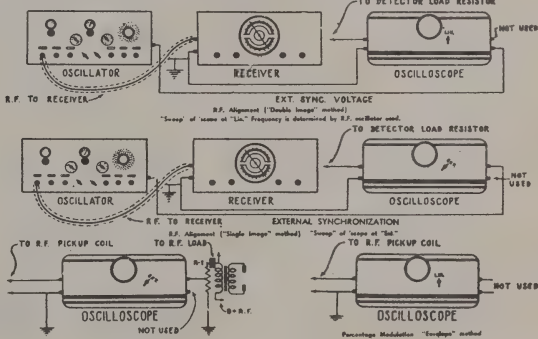
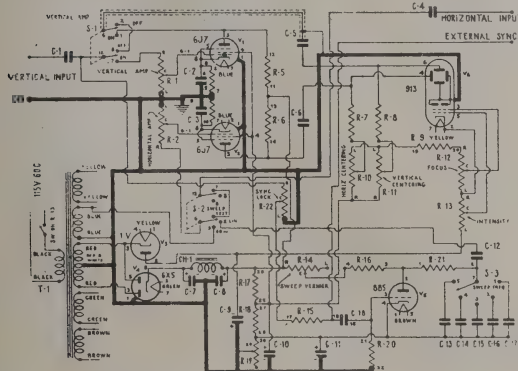
MISCELLANEOUS PARTS

	List Price
2 Metal tube grid caps @ 2c each	.04
1 4-prong Socket (for 1-V tube) (American Phenolic or equivalent)	.11
1 5-prong Socket (for 885 tube) (American Phenolic or equivalent)	.11
4 Octal Sockets (for 2-6J7, 6X5, 913 tubes (American Phenolic or equivalent) @ 14c each	.56
11 1/2" bar knobs @ 15c each	1.65
9 5-lug resistor mounting strips @ 8c each (Cinch #1550)	.72
1 2-lug resistor mounting strip @ 4c each (Cinch #1520)	.04
24 6-32 nuts, screws, and lockwashers	.10
1 A.C. line cord and plug	.35
4 Pin jacks @ 9c each	.36
4 Pin jack plugs @ 9c each	.36
3 3/4" Grommets @ 3c each	.09
1 1/4" Grommet	.03

NOTE -The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

USING THE OSCILLOSCOPE

Typical connections for R.F. alignment of receiver and for percentage modulation of a transmitter.



Highest quality standard parts are used throughout. An accurately planned foundation unit with explicit instructions enable the builder to complete a perfectly engineered instrument, a professional job, at a surprisingly low cost. Small overall size—6¾ x 10½ x 5⅝ makes it a handy portable unit for the serviceman. It fits neatly into the amateur station cabinet or 5¼ x 19 relay rack. Large panel open-

ing with a funnel shaped shield tapering off to the tube, and a 2" magnifying lens produces a large, clear image. These practical features together with important technical advantages rate the Thordarson oscilloscope high in quality, dependable in performance and low in cost. Be satisfied with only the Best. Get a Thordarson foundation unit and "build your own."

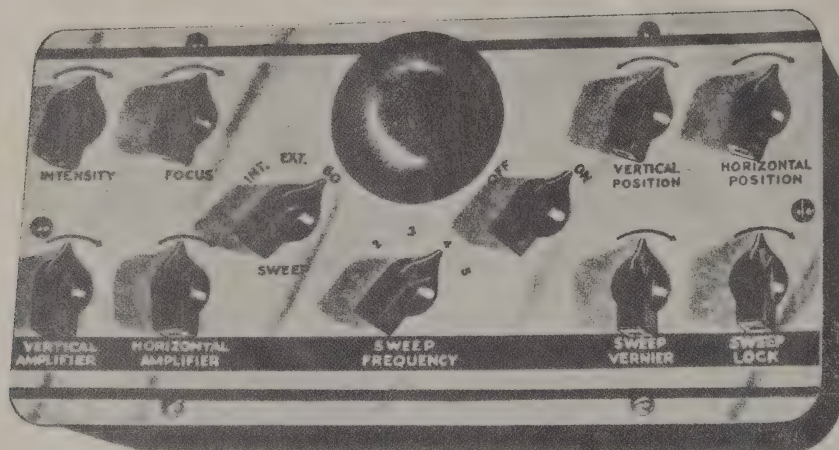
THORDARSON ELECTRIC MFG. CO.

500 W. HURON ST., CHICAGO, ILL.

THORDARSON Oscilloscope

"Build It Yourself"

Using the NEW 913 CATHODE-RAY tube

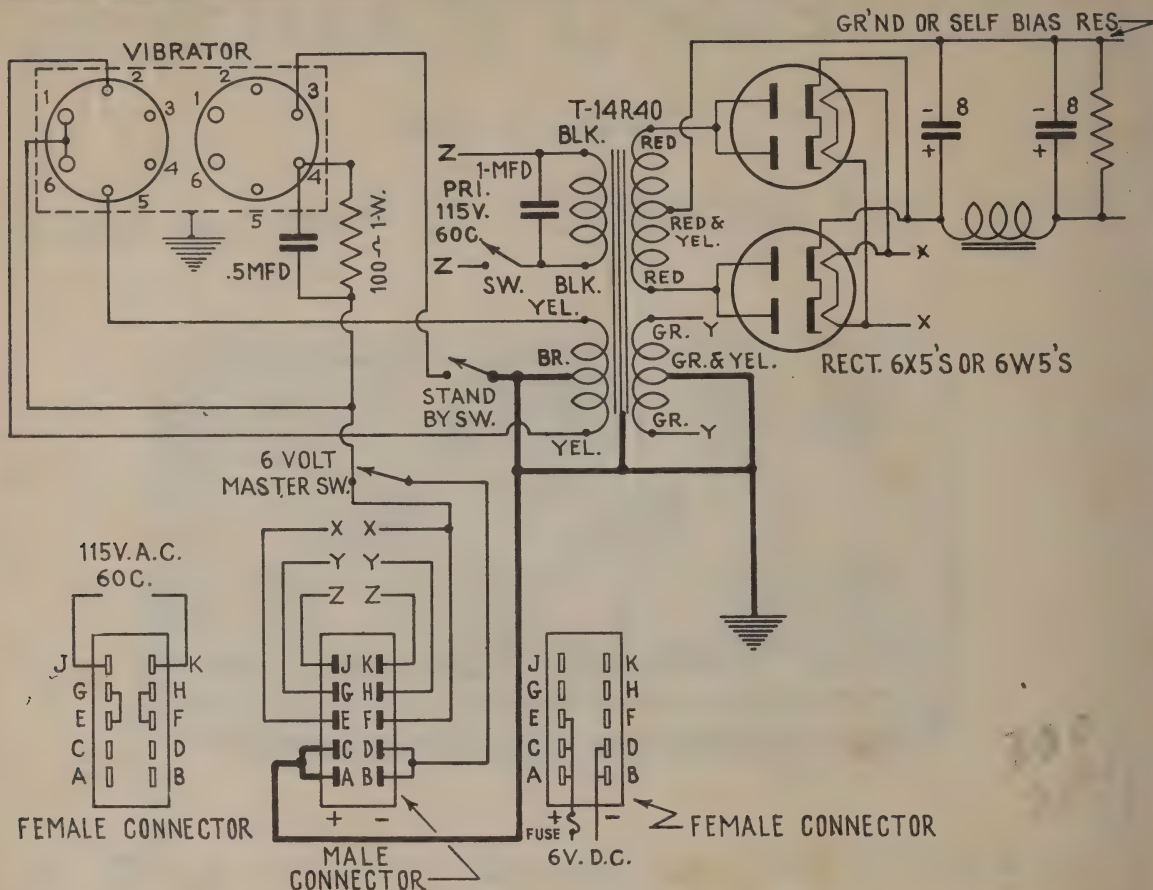


**A Complete Quality Instrument
at Surprisingly Low Cost**

All the Features Found in Higher Priced and Larger Oscilloscopes

- | | | |
|--|--|--|
| 1—Intensity control. | 7—Sweep lock-in control for absolute synchronization of sweep frequency with signal frequency. | 12—Panel selector switch for linear, 60 cycle or external sweep. |
| 2—Focus control. | 8—Sweep amplifier stage. | 13—On and off panel switch for vertical amplifier. |
| 3—Horizontal centering control. | 9—Signal amplifier stage. | 14—Optional Thordarson panel with all control positions marked. |
| 4—Vertical centering control. | 10—60 cycle and external sweep. | 15—Optional lens for magnification of figure. |
| 5—Self-contained linear sweep covering frequencies from 20 to 12,000 cycles in 5 ranges. | 11—Provides for "Single" or "Double image" R. F. alignment. | |
| 6—Vernier control of sweep frequency. | | |





This transformer may be used from a 115 volt 60 cycle line or from a 6 volt DC source in conjunction with a vibrator. A typical circuit is shown using an Electronics #490 vibrator. One power cable connector is wired for 6 volts DC and another for 115 volts AC. A common recessed male connector is used.

The high voltage output is 350/350 volts AC or 370 volts DC at 135 MA DC to the filter, and 340 volts DC from filter using a T-17C00-B choke.

The filament secondary is rated at 6.3 volts at 4.75 amperes (green) and is used only when operating on 115 volt AC Primary. The heaters are automatically switched when the 6 volt cable plug is inserted. A 30 ampere fuse is included in one line of the 6 volt input.

A buffer condenser of approximately 1.0 mfd. is used across the 115 volt primary (black).

THORDARSON ELECTRIC MFG. CO.

500 W. HURON ST., CHICAGO, ILL.

Demand "Power by Thordarson"

CONNECTIONS OF UNIVERSAL MODULATION TRANSFORMERS

(S-18, S-19, S-20, S-21, S-22)

PRIMARY		SECONDARY												
P to P Imp.	P-B-B-P	Join 3 & 4 Con. to 1 & 6	Join 3 & 4 Con. to 2 & 6	Join 2 & 3 Con. to 1 & 6	Join 3 & 4 Con. to 2 & 5	Join 1 & 3 & 4 & 6 Con. to 1 & 4	Join 7 & 11 8 & 12 Con. to 7 & 8	Join 1 & 5 2 & 6 Con. to 1 & 2	Join 9 & 10 Con. to 7 & 12	Join 9 & 10 Con. to 8 & 12	Join 9 & 10 Con. to 8 & 11	Join 8 & 9 Con. to 7 & 12	Join 7 & 9 10 & 12 Con. to 7 & 10	Join 8 & 9 10 & 11 Con. to 8 & 10
Line to RF	500 ohms connected to 7 and 8; join 7 to 11 and 8 to 12	15000	9400	7800	5000	3800								
Line to RF	500 ohms connected to 1 and 2; join 1 to 5 and 2 to 6								16000	11000	8000	7000	4000	2000
2000	2-3-4-5						200		8500	6400	4300	3600	2150	1100
2000	1-2-5-6						350		16000	11500	8000	6500	4000	2000
3000	2-3-4-5						300		13000	9500	6500	5500	3200	1600
3000	1-2-5-6						500		23500	17000	12000	10000	6000	3000
3800	2-3-4-5						400		16400	12000	8200	7000	4000	2000
3800	1-2-5-6						650		30000	21500	15000	12500	7500	3750
4000	2-3-4-5						400		17500	12500	8600	7300	4300	2150
4000	8-9-10-11	5500	3500	3000	1850	1400		250						
5000	2-3-4-5								21500	16000	11000	9200	5400	2700
5000	8-9-10-11	7000	4300	3500	2300	1750		300						
6000	1-3-4-6						200		8500	6400	4300	3600	2100	1050
6000	8-9-10-11	8900	5200	4250	2750	2200		370						
6600	1-3-4-6						200		9500	7000	4750	4000	2400	1200
6800	8-9-10-11	9000	5600	4650	3000	2400		400						
7000	1-3-4-6						225		10000	7300	5000	4300	2500	1250
7000	8-9-10-11	9700	6000	5000	3200	2500		425						
8000	1-3-4-6						275		12000	8500	6000	5000	3000	1500
8000	8-9-10-11	11000	7000	5650	3700	2800		500						
9000	1-3-4-6						300		13000	9500	6500	5500	3200	1600
9000	8-9-10-11	12500	7750	6300	4200	3000		550						
9000	7-9-10-12	6000	4000	3200	2000	1500		275						
10000	1-3-4-6						325		14500	10500	7000	6000	3500	1750
10000	8-9-10-11	14000	8500	7000	4500	3500		600						
10000	7-9-10-12	7000	4300	3500	2300	1750		300						
12000	1-3-4-6						400		17500	12500	9000	7250	4300	2150
12000	7-9-10-12	8400	5200	4250	2750	2100		375						
14000	7-9-10-12	10000	6000	5000	3200	2450		425						
16000	7-9-10-12	11000	7000	5600	3700	2800		500						
18000	7-9-10-12	12500	7750	6300	4200	3150		550						
14000	13-3-4-14								12000	8000	5500	4700	3000	1500
16000	13-3-4-14								13000	9000	6500	5500	3200	1600
18000	13-3-4-14								15000	10500	7000	6000	3500	1750
20000	13-3-4-14								16500	11500	8000	7000	4000	2000
22000	13-3-4-14								18000	13000	9000	7500	4500	2250

S-22 ONLY

S-22 ONLY

S-19 — 30 WATTS MAX.									
(53, 56, 6C6 triode, 6N7, may be substituted for 6C5 tubes)									
DRIVER		MODULATOR STAGE							
Tube or Tubes	Transf.	Sec. Term.	P.P. Tubes	Watts Outp't	P.P. Load	Plate Volts	Bias Volts		
6C5	S-10	G-G	6V6	13	8,000	300	20		
6C5	S-2	G-G	6B5	13.5	10,000	325	0		
6C5	S-10	G-G	2A3, 6A3, 45, 6A5G, 6B4G	15	3,000	325	68		
6C5	S-10	G-G	2A5, 42, 6F6, Pentode AB	10	10,000	375	340 ohms		
2A5	S-8	G-G	2A5, 42, 6F6, triode AB	18	6,000	350	38		
89	S-8	G'-G'	Parallel 53's, 6A6, 6N6, 6N7	19	5,000	300	0		
45	S-8	G-G	10, 1602	25	8,000	425	50		
45	S-8	G'-G'	46, 59	25	6,000	425	0		
45	S-8	G'-G'	841	28	7,000	425	5		
6C5	S-10	G-G	6L6 self bias	30	6,600	400	23		

TYPICAL MODULATOR COMBINATIONS (Cont.)

S-20 — 55 WATTS MAX.											
DRIVER			MODULATOR STAGE								
P.P. Tubes	Transf.	Sec. Term.	P.P. Tubes	Watts O'p't	P.P. Load	Plate Volts	Plate Tr'sf.	Bias Volts	Bias Trsf.		
Single 45	S-8	G'-G'	46	40*	5000	470	S-44	0			
2A3	S-9	1-1	801	45	10000	600	S-45	75	S-51		
2A3	S-9	3-3	1608	50	5000	425	S-44	15	S-51		
2A3	S-9	1-1	T-20	50	8000	600	S-45	30	S-51		
Single 45	S-8	G'-G'	4-46, 59	56	3000	425	S-44	0			
6C5	S-10	G-G	6L6 AB2	60	3800	400	S-39	25	S-51		
6C5	S-10	G-G	4-6L6	60	3300	400	S-40	23			
2A3	S-9	3-3	809	60	5000	500	S-41	0			

* Above manufacturers' rating, but frequently employed by amateurs.

Drivers—S-8, S-9, S-10



SPECIAL SERIES PLATE AND FILAMENT TRANSFORMERS

TERMINAL BOARD LAYOUTS

S-39

115V.		2.5V.-6A.		
●	●	○	○	○
1	2	3	4	5
5V.-3A.		6.3V.-4A.		
○	○	○	○	○
6	7	8	9	10
490V.	400V.	0	400V.	490V.
○	○	○	○	○
11	12	13	14	15

S-40 D.C. Voltages*
400/300

115V.		6.3V.-3A.		
●	●	○	○	○
1	2	13	14	15
525V.	425V.	C.T.	425V.	525V.
○	○	○	○	○
8	11	10	12	9
5V.-3A.		6.3V.-3A.		
○	○	○	○	○
3	4	5	6	7

*Based on a two section filter, choke input.

S-41

115V.		6.3V.-2A.		
●	●	○	○	○
1	2	8	9	10
600V.	C.T.	600V.		
○	○	○		
5	6	7		
5V.-3A.	0	6.3V.	7.5V.-3A.	
○	○	○	○	
3	4	11	12	13

S-42

115V.		0	6.3V.	7.5V.
●	●	○	○	○
1	2	8	9	10
600V.	525V.	C.T.	525V.	600V.
○	○	○	○	○
3	6	5	7	4
6.3V.-3A.			5V.-3A.	
○	○	○	○	○
11	12	13	14	15



CONNECTION CHARTS SPECIAL SERIES TRANSFORMERS PRIMARY CONNECTIONS

S-5, S-6

Connect terminals marked 'M' to mike.

S-7

Connect P to plate; B to plate return; 'M' to mike.

S-8, S-9, S-10

See modulator charts, for tube types and connections.

S-12, S-13

For 500 ohms, connect to 1 and 2

For 2000 ohms, connect to 2 and 3

For 4000 ohms, connect to 1 and 3

S-14 Single tubes

Always connect to 1 for plate return.

Connect plate to 2 for 2500 ohms, for 2A3, 6A3, 6A5G, 6B4G, 6L6, 6Y6, 25L6.

Connect plate to 3 for 4000 ohms, for 2A5, 6F6 triode, 12A5, 25A6, 43, 45, 50, 71A.

Connect plate to 4 for 7000 ohms, for 2A5, 6F6, 6K6, 20, 31, 33, 47.

Connect plate to 5 for 10,000 ohms, for 6G6, 38, 41.

S-15 P.P. Tubes.

Always connect to 4 for plate return.

Connect to 3 and 5 for 4000 ohms, for 25L6, 6Y6G.

Connect to 2 and 6 for 5000 ohms, for 2A3, 6A3, 6A5G, 6B4G, 45.

Connect to 1 and 7 for 10,000 ohms, for 19, 7J6G, 30, 49, 89, 6Z7G, 6AC5G, 53, 6A6, 6N6, 6N7, 6B5.

S-16 P.P. Tubes

Always connect to 4 for plate return.

Connect to 3 and 5 for 3000 ohms, for 2A3, 6A3, 6A5G, 6B4G, AB.

Connect to 2 and 6 for 6000-6600 ohms, for 2A5-6F6-42 triodes AB, 46, 59, 6L6.

Connect to 1 and 7 for 10,000 ohms, for 6B5, 6V6, 2A5-6F6-42 pentodes AB.

S-17 P.P. Tubes

Always connect to 4 for plate return.

Connect to 3 and 5 for 3300 ohms, for four 6L6's, four 46's.

Connect to 2 and 6 for 3800 ohms, for two 6L6's, AB2.

Connect to 1 and 7 for 5000 ohms, for 1608, 809.

S-18, S-19, S-20, S-21, S-22

See modulation charts

SECONDARY CONNECTIONS

S-12, S-13, S-14, S-15, S-16, S-17

For 2 ohms, connect to 8 and 15. All other impedances as indicated.

S-73

Sec.—for 800's, 801's, connect grids to 1-1; for 805's, 830B's, 6L6's, 46's, grids to 2-2; for 809's, 838's, 203A's, ZB120's, grids to 3-3; Grid-return always to 'F.'

S-74

115V.

o o

C.T.

o

o o

1000

o o

2350

Maximum D.C. current when both windings are used, 150 MA. on each winding.

Maximum D.C. current on low voltage section 300 MA. (IF USED ALONE). Maximum D.C. current on high voltage section 200 MA. (IF USED ALONE).

UNITED TRANSFORMER COMPANY

150 Varick Street, New York 13, N. Y.

TYPICAL MODULATOR COMBINATIONS

S-21, Driver, S-9

S-22, Driver, S-9

BIAS TRANSFORMER CONNECTIONS

S-51, S-52

S-21 — 115 WATTS MAX.

P.P.-2A3 Driver S-9 Transf. Sec. Term.	P.P. Tubes	Watts Output	MODULATOR STAGE P.P. Load	Plate Volts	Plate Transf.	Bias Volts	Bias Trsf.
2-2	TZ-20	70	12000	800	S-46	0	
1-1	T-20	70	12000	800	S-46	40	S-51
*	845	75	4600	1000	S-47	175	S-52
3-3	4-46, 59	80	2500	470	S-44	0	
1-1	807	80	6600	600	S-45	30	S-51
1-1	800 RK-30	90	6600	750	S-45	40	S-51
1-1	800 RK-30	100	12000	1000	S-47	55	S-51
3-3	809	100	8400	750	S-45	5	S-51
2-2	825	100	6600	850	S-46	30	S-51
2-2	TZ-40	100	8000	750	S-45	0	
2-2	T-756	100	7000	850	S-46	30	S-51
1-1	50-T	100	8000	1000	S-47	90	S-51
2-2	RK-18	100	12000	1000	S-47	50	S-51
1-1	HK-354	100	15000	1000	S-47	60	S-51
*	845	105	8800	1250	S-47	225	S-52
3-3	RK-31	110	14000	1000	S-47	0	
1-1	4-6L6	110	2000	400	S-44	25	S-51
2-2	35-T	115	11000	1000	S-47	30	S-51

* Reverse S-9 transformer using terminals 1-1 for plates and P-P for grids.

Using the Special Series bias transformers any desired value of DC within the transformer rating can be obtained within approximately 6%. In most cases this eliminates the necessity for a voltage divider and improves the bias supply regulation accordingly.

The DC voltages shown are based at 200 Ma.—single section filter—choke input—120 ohm choke. Lower values of DC will increase the output voltage somewhat.

Secondary Terminals	Primary Terminals 115 V. 50/60 cycles	S-51		S-52	
		A.C. Volts each side	D.C. Volts	A.C. Volts each side	D.C. Volts
8-10-11-13	1-2	155	100	490	400
	1-3	141	87	445	360
	1-4	129	76	406	326
	1-5	119	67	376	298
	1-6	111	60	350	275
	1-7	106	55	326	254
9-10-11-12	1-2	94	45	300	230
	1-3	86	37	273	205
	1-4	78	30	249	184
	1-5	72	25	230	167
	1-6	67	20	214	152
	1-7	63	17	200	140
8-9-12-13	1-2	61	15	190	132
	1-3	55	10	173	117
	1-4	51	6	159	103
	1-5	47	3	147	92
	1-6	44	—	137	83
	1-7	41	—	127	74

S-18 — 12 WATTS MAX.

DRIVER TUBES: In the combinations shown below, typical suitable driver tubes are: 27, 30, 37, 49, 53, 56, 76, 79, 89, 6A6, 6C5, 6C6 triode, 6E6, 6N7.

DRIVER Transf.	Sec. Term.	P.P. Tubes	Watts Output	MODULATOR STAGE P.P. Load	Plate Volts	Bias Volts
S-2	G-G	6E6	1.6	14,000	250	27
S-8	G-G	19, 1J6C	2.1	10,000	135	0
S-8	G-G	30	2.5	10,000	180	18
S-8	G-G	49	3.5	12,000	180	0
S-8	G'-G'	89	3.5	10,000	180	0
S-2	G-G	25L6	4	4,000	110	7.5
S-8	G'-G'	627G	4.2	12,000	180	0
S-2	G-G	6Y6G	7	4,000	135	13.5
S-8	G-G	79, 6Y7G	8	14,000	250	0
S-8	G'-G'	6AC5G	8	10,000	250	0
S-8	G'-G'	53, 6A6, 6N6, 6N7	10	10,000	300	0
S-2	G-G	2A3, 6A3, 6A5G, 6B4G	10	5,000	325	750 ohms
S-2	G-G	6B5	10	10,000	300	0
S-8	G-G	45	10	5,000	275	770 ohms
SINGLE TUBES						Pri. Load
S-1	F-G	43, 45, 59, 71A, 12A5, 25A6, 25A7				4000 ohms
		31, 46, 59, 6V6, 33				6000 ohms
		33, 42, 46, 47, 49, 89, 2A5, 6F6, 6B5				7000 ohms
		59, 89 pentode				8000 ohms
		10, 41, 42, 6G6, 6K6				10,000 ohms
		38, 12A7				14,000 ohms

S-22 — 250 WATTS MAX.

P.P.-2A3 Driver S-9 Transf. Sec. Term.	P.P. Tubes	Watts Output	MODULATOR STAGE P.P. Load	Plate Volts	Plate Transf.	Bias Volts	Bias Trsf.
3-3	RK-31	140	17000	1250	S-47	0	
*	50 T	135	12000	1250	S-47	112	S-52
*	50 T	250	20000	2000	S-50	180	S-52
*	50 T	160	17000	1500	S-49	140	S-52
2-2	TZ-40	175	6800	1000	S-47	0	
1-1	T-55	175	6900	1000	S-47	40	S-51
1-1	T-55	225	9400	1250	S-47	50	S-51
2-2	HF-100	200	7000	1000	S-47	35	S-51
2-2	HF-100	250	12000	1500	S-49	52	S-51
2-2	100 TH	200	5200	1000	S-47	0	
2-2	100 TH	250	7200	1250	S-47	0	
†	100 TL	170	5200	1000	S-47	90	S-51
†	100 TL	230	7200	1250	S-47	112	S-52
2-2	ZB-120	150	4800	750	S-45	0	
2-2	ZB-120	200	6900	1000	S-47	0	
2-2	ZB-120	245	9000	1250	S-47	0	
*	HK-154	200	7500	1000	S-47	155	S-52
*	HK-154	225	11400	1250	S-47	210	S-52
1-1	203 A	200	6900	1000	S-47	35	S-51
1-1	203 A	250	9000	1250	S-47	45	S-51
3-3	203 Z	200	6900	1000	S-47	0	
2-2	203 Z	250	6700	1100	S-47	0	
1-1	211	200	6900	1000	S-47	77	S-51
1-1	211	250	9000	1250	S-47	100	S-51
1-1	HK-354	220	15000	1500	S-49	100	S-51
2-2	808	190	12700	1250	S-47	15	S-51
2-2	830 B	175	7600	1000	S-47	35	S-51
2-2	838	200	6900	1000	S-47	0	
2-2	838	250	9000	1250	S-47	0	

* Reverse S-9, using 2-2 for plates and P-P for grids.

† Reverse S-8, using 1-1 for plates and P-P for grids.